

Salmon Habitat Recovery Strategy

for the Hood Canal & the
Eastern Strait of Juan de Fuca

Version 9-2002



Hood Canal
Coordinating Council



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Table of Contents

Introduction & Vision Statement	1
Geographic Priorities & Drainage Tiers	6
Monitoring & Adaptive Management	8
Area Wide, Single Agency Priority Problems	12
Estuary and Nearshore/Marine Areas	13
List of Independent Anadromous Drainages	18
Jefferson County/WRIA 17 Sequenced Project Lists	20
Jefferson County/WRIA 16 Sequenced Project Lists	39
Mason County/WRIA 16 Sequenced Project Lists	45
Mason County/WRIA 14 Sequenced Project Lists	55
Mason County/WRIA 15 Sequenced Project Lists	62
Kitsap County/WRIA 15 Sequenced Project Lists	75
References	86

List of Figures

Figure 1, Map of the Hood Canal Summer-run Chum Salmon ESU	7
Figure 2, Map of the Salmon and Snow drainages	20
Figure 3, Map of the Chimacum drainage	25
Figure 4, Map of the Big and Little Quilcene drainages	33
Figure 5, Map of the Dosewallips drainage	39
Figure 6, Map of the Duckabush drainage	42
Figure 7, Map of the Hama Hama drainage	45
Figure 8, Map of the Lilliwaup drainage	48
Figure 9, Map of the Skokomish drainage	54
Figure 10, Map of the Union, Tahuya and Dewatto drainages	63
Figure 11, Map of the Big Anderson and Big Beef drainages	75

List of Tables

Table 1, Geographic Priorities	6
Table 2, Monitoring and Adaptive Management	12



Introduction

This Strategy was developed with the help and involvement of a variety of persons and groups in the Hood Canal and Eastern Strait of Juan de Fuca area interested in undertaking salmon habitat recovery projects. It was developed in response to the need for a common “script” for all of them to work from, to not duplicate their efforts, or work at cross purposes, and to work as strategically as possible on the projects that will have the biggest benefit to the most numbers and species of fish possible.

This Strategy is set within a context of other issues and efforts to recover salmon. In most discussions of salmonid population decline, and potential extinction, the “Four H’s” are mentioned. Those “H’s” represent the issue areas that must be addressed to recover salmon and sustain their recovery over time (National Research Council 1996.) Those “Four H’s” are: **Harvest Management, Hatchery Production and Supplementation, Hydropower Management (dams)** and **Habitat Protection and Restoration** (National Research Council 1996). This Strategy directly addresses the Habitat Protection and Restoration issue area.

Harvest Management is addressed by the State of Washington and the Treaty Tribes acting as “Co-managers” as defined in the “Boldt Decision” and affirmed by the US Supreme Court (US v. Washington 384 F. Supp. 312 (1974.)) They jointly determine fish harvest rules and enforcement regulations and are overseen by federal agencies to ensure no impact is made to fish listed under the federal endangered species act. **Hatchery Production and Supplementation** in Hood Canal and the Eastern Strait consists of hatcheries and smaller reintroduction efforts by the Co-managers, private groups and federal agencies. These efforts are also overseen by federal agencies to avoid creating problems for listed species. The **Hydropower Management (dams)** issue is regulated either by state agencies or the federal government, depending on ownership, size and function of the dam. Smaller dams are regulated by Washington State and the larger dams are regulated by a federal agency. Again, both state and federal agencies are charged with not harming listed fish.

The three “H’s” described above are certainly not easy to address, however, in comparison to **Habitat Protection and Restoration** issues, they have fewer involved

and affected parties and arguably fewer and less complex issues to resolve. Those many habitat issues and affected parties are what this Strategy focuses on. To further define the habitat issue and our approach, and keep it in manageable terms, it must be divided into three parts. That division will help us differentiate between what can be addressed directly with projects or regulatory actions, and what cannot be directly addressed. Those three parts are: **ocean and climate conditions, regulation of land use and development, and direct protection and restoration actions.**

Ocean and climate conditions are not directly manipulable by humankind, except for longer range work on the reduction of greenhouse gases and carbon sequestration. In the shorter term, ocean and climate conditions can only be monitored and adapted to with plans, activities and greater efforts in the other areas where we can effect change. With regard to **regulation of land use and development**, it is a highly political process and is generally the province of local governments. Only the cities and counties with appropriate jurisdiction can address habitat protection through regulation of private lands. Generally, federal and state agencies only have direct regulatory control over land use on lands that are owned by those agencies. The last part, direct **protection and restoration project activities**, is where this Strategy focuses. It has been developed to identify and describe habitat problems and guide voluntary salmon habitat protection and restoration efforts and projects.

To apply this Strategy, we hope to implement, and ultimately attain, the following **Vision and Goals**. Our **Vision** is that the Hood Canal Coordinating Council and its partners will assure the continuing existence of wild salmon in the Hood Canal and the Eastern Strait of Juan de Fuca watersheds. We will do this by implementing strategic actions to maximize the productive capacity of that habitat. We will do this to achieve genetically diverse, self-sustaining and abundant salmon populations that will support healthy ecosystems, and ceremonial, subsistence, recreational and commercial fisheries throughout the Canal and Eastern Strait. This vision was developed at a meeting of our project partners in the spring of 2000.

To implement this Vision, our **Goals** are to 1) direct assessment, protection and restoration activities into the geographic areas with the most productive potential for salmon; 2) have those activities be the most appropriate types of activities; and 3)

have them be the highest priority activities for those particular watersheds, estuaries and nearshore areas. Each of these goals can be implemented through this Strategy.

To address the geographic areas with the most productive potential in which to work, we have developed a prioritized listing of drainages. It is our **Geographic Priorities and Drainage Tiers section**, starting on page 5 in this Strategy. It groups watersheds, their associated estuaries, and the nearshore into a hierarchy of “Tiers” that range from Tier I having the most productive potential and species diversity to Tier V having less productive potential and species diversity. We believe these Tiers represent a prioritization of the individual geographic areas that are the most significant for salmon in the Hood Canal and Eastern Strait of Juan de Fuca, as well as in the larger Puget Sound context. It should be noted that while productive potential is lower for individual streams in lower Tiered drainages, a series of these drainages could collectively be of equal or greater significance to salmon than a single drainage in a higher Tier. This Tiering structure was developed over several meetings of our HCCC Technical Team and then validated through additional meetings with our project partners over the summer of 2000. The revisions have been informed by new information from the Puget Sound Technical Recovery Team on independent populations of Chinook in the Canal and additional discussions with our project partners and our local Technical Team at meetings in the summer of 2002.

We have also developed **Sequenced Project Lists** for each of our drainages and associated estuaries listed in the Geographic Priorities Table, based on watershed and other specific information and studies. Those listed projects target locations and prioritize actions that will have the greatest benefit to the most imperiled stocks while supporting currently healthy stocks. Those sequenced project lists start on page 18 of this Strategy. These lists were developed in local meetings in Jefferson, Kitsap and Mason Counties with our project partners and local scientific expertise including those partners’ and tribal and state agency personnel. Those meetings took place in the summer of 2000. Revisions to those lists were made using the same process starting in the winter and spring of 2001.

In looking at the types of actions that might be undertaken, we have developed a ‘philosophy’ to guide ourselves. That philosophy looks generically at assessment, protection and restoration. It suggests, when contemplating a project or activity, one should first be sure that one has adequate information on which to base an action.

then one should determine if the habitat warrants protection and/or restoration. This 'hierarchy' of actions is proposed as a general guide by which to begin one's thinking about which actions to take. It is not proposed to override the geographic direction given in the Geographic Priorities and Drainage Tiers nor the specific actions advocated in the Sequenced Project Lists for each drainage.

In addition to directly addressing the biological needs of the fish, we also recognize that community support, land owner willingness and project sponsor preference factors must be fostered over time to move project actions toward higher Tier drainages. Under the Salmon Recovery Act (RCW 77.85) all salmon recovery activities associated with this Strategy are voluntary, and that, by definition, means a gradual move by project sponsors toward the higher Tier drainages. Another factor that hinders the movement of project sponsors toward Tier I drainages is the fact that they are big water systems that are less well understood. Also, the potential projects in those areas will by necessity be larger scale, more complex and much more expensive. Having said that, it must also be noted that while we started in 1998 (in the first IRT process – the precursor to the SRFB process) with the bulk of our work in the lower Tiered drainages, we have shifted over time to greater and greater numbers of projects being proposed in the Tier I areas. With additional work, we will succeed in addressing higher Tier issues, but again, this will take time. Ultimately, we understand that without local community understanding of, involvement in, and enthusiasm for these actions, attempts to implement them and this Strategy, will not be sustainable.

To address that need for community support of projects, and to fulfill the grass-roots vetting of projects required in the Salmon Recovery statute, the actual ranking of projects for submission to the SRFB necessarily requires the balancing of biologically driven needs and political acceptability. That balancing test is met by our final 'citizen' ranking of projects for SRFB submittal. In addition to having a more locally acceptable list of projects, this citizen ranking also gives us the opportunity to work incrementally towards communities that are less interested or willing to engage in

salmon habitat restoration. It does that by making headway now with land owners who are enthused with projects happening on their land and then being able to point to those satisfied land owners when addressing other less committed land owners in other areas.

Although this Strategy is focused on the prioritization of habitat protection and restoration projects, that does not mean it is intended to function independently. Its intent is to link with and adapt to actions taken in the other “H” areas where appropriate. When changes are identified in those other “H’s” that affect the validity of this Strategy, or its various parts, it will be revised and updated to provide the most timely description of habitat protection and restoration needs possible.

By advocating all the actions described in this Strategy, as well as actions within the realm of the other “H’s,” we believe that attaining the productivity abundance, diversity and distribution needed to help recover salmon and the ecosystems on which they depend is possible.

This Strategy approach is consistent with other habitat strategies that have been proposed for Pacific Northwest watersheds (Beechie et al. 1996; Bradbury et al. 1995; Frissell 1993; NMFS 1996; Reeves et al. 1996). It grew out of discussions among HCCC members and our partners to provide a unified vision of habitat recovery in Hood Canal and the Eastern Strait of Juan de Fuca. It is also consistent with, and builds upon, many other efforts and sources of information developed in the Hood Canal and Eastern Strait. Some of those efforts include the Summer Chum Salmon Conservation Initiative, the Dungeness/Quilcene plan, existing watershed plans, and US Forest Service and Washington Department of Natural Resources watershed analyses and assessments (see page 81, references.)

Geographic Priorities¹ Table

Tier I

Dosewallips, Duckabush, Hama Hama, and Skokomish river watersheds^{2,3,5}; all Hood Canal and Eastern Strait of Juan de Fuca marine shorelines and estuaries upstream to the height of tide.

This Tier consists of drainages that have the capacity, or potential (historically based) capacity, to be habitat for 2 or more ESA listed species (Summer Chum and Chinook primary usage, and possibly Bull Trout usage.)

Tier II

Little Quilcene, Big Quilcene, Lilliwaup, Union, Tahuya and Dewatto river watersheds^{3,5}.

This Tier consists of drainages that have the capacity to be habitat for 1 ESA listed species and possible habitat for an additional ESA listed species (Summer Chum critical usage and possible Chinook usage.)

Tier III

Salmon, Snow, Chimacum⁴, Big Anderson and Big Beef⁴ creek watersheds⁵.

This Tier consists of drainages that have the capacity to be habitat for 1 ESA listed species (Summer Chum usage), and/or SASSI listed critical stocks.

Tier IV

Little Goose, Piddling, Ludlow, Unnamed 17.0191, Shine, Bones/Hubbard, Thorndyke, Fisherman Harbor, Camp Discovery, Tarboo, Jakeway, Donovan, Indian George, Spencer, Marple, Turner, Walker, McDonald, Fulton, Schaerer, Waketickeh, Jorsted, Eagle, Little Lilliwaup, Sund, Miller, Clark, Finch, Hill, Enatai, Minerva, Alderbrook/Big Bend, Twana, Unnamed 14.0133, Forest Beach, Unnamed 14.0131, Unnamed 14.0130, Happy Hollow, Unnamed 14.0128, Holyoke, Lakewood, Devereaux, Sweetwater, Big Mission, Little Mission, Johnson 15.0492, Hall, Stimson, Unnamed 14.0186, Unnamed 14.0185, Cady, Little Shoofly, Shoofly, Caldervin, Brown, Rensland, Don Lake, Harding, Nellita, Boyce, Stavis, Seabeck, Little Beef, Johnson 15.0387, Little Anderson, Cattail Lake, Jump-Off-Joe, Cougar, Gamble and Martha John Creek watersheds⁵.

This Tier consists of drainages that have the capacity to be habitat for SASSI listed depressed stocks (less important Summer Chum usage, usage by Coho, Pinks and Winter Steelhead.)

Tier V

Streams containing non-anadromous, or cutthroat only, fishes and all other Independent Drainages not listed above.

This Tier contains all drainages not specifically listed in any of the other Tiers.

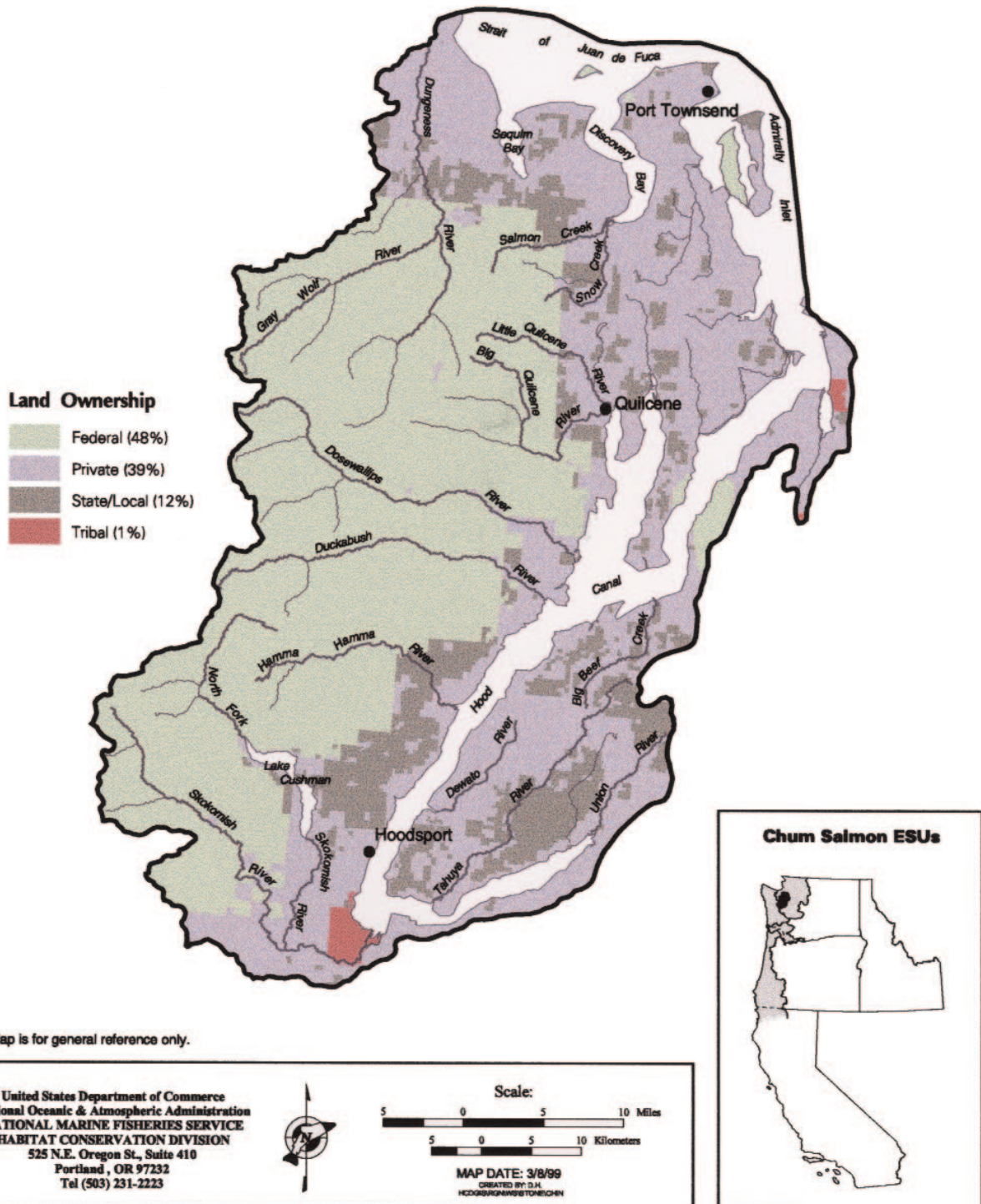
1. Drainages listed are only those that are independent drainages to Hood Canal & the Eastern Strait. All other water bodies and creeks that are tributary to an independent drainage are considered subsumed under that independent drainage name.
2. The Skokomish River is identified in the Independent populations of chinook salmon in Puget Sound draft report as supporting an independent chinook population. The report equivocates about whether the Dosewallips, Duckabush and Hama Hama Rivers had small, self-sustaining chinook populations or were supporting chinook spawners largely driven by the Skokomish source population. Puget Sound Technical Recovery Team Draft Report, April 2001, pages 27-28.
3. Identified in Salmon and Steelhead Stock Inventory, Appendix One (Puget Sound Stocks), Hood Canal and Strait of Juan de Fuca Volume, December, 1994, as potential Chinook spawning areas.
4. Summer Chum extirpated, reintroduced through stock reintroduction program.
5. Depicted as utilized by summer chum on WDFW chum distribution maps, August, 1999. (Vol. 65, No. 32, page 7774).

Table 1

Figure 1



HOOD CANAL SUMMER-RUN CHUM SALMON ESU



Geographic Priorities

This strategy recognizes that the productive capacity of different watersheds is not equal; larger, less disturbed, glacier-fed watersheds tend to support larger, more diverse salmon populations. In the Hood Canal and the Eastern Strait of Juan de Fuca several large watersheds that drain the eastern Olympic Mountains support the greatest numbers and diversity of salmonids as well as salmonids that have been identified as either endangered by federal authorities (NMFS, NOAA, Commerce. 1999) or by the State of Washington (WDF et al. 1993). Those watersheds also have their headwaters protected inside the Olympic National Park.

Additionally, estuaries and marine nearshore environments are important to all anadromous fish. They are used by numerous stocks, regardless of their watershed of origin, and are listed as high priority in this strategy. The scientific basis for this “refugia” approach is now commonly accepted (Frissell 1993). It emphasizes protection of remaining high-quality habitats and the migration corridors that connect them. Unfortunately, we currently lack the information to prioritize specific geographic shoreline segments with any scientific certainty. Until we have sufficient information, this Strategy takes a conservative approach and lists all estuaries and marine shoreline segments in the highest level (Tier I) of our geographic prioritization.

This geographic ranking is arrayed from more productive potential and species diversity (Tier I) to less productive potential and species diversity (Tier V) based on the area’s regional importance, significance to Endangered Species Act (ESA) stocks listed as threatened, and Salmon and Steelhead Stock Inventory (SASSI) stocks listed as critical and depressed (WDF et al. 1993).

Monitoring and Adaptive Management

Monitoring and adaptive management are necessary components for any of the actions taken under this Strategy to protect and restore salmon habitat. Monitoring gives us the ability to measure our success. Just as importantly, adaptive management gives us the ability to use that monitoring information to take more effective and efficient actions in the future. The Hood Canal Coordinating Council has recently begun looking at what it would take to put a monitoring program in place for the whole Summer Chum ESU. A starting place is the recently published Independent Science Panel’s report on monitoring (ISP 2001).

The Independent Science Panel (ISP) is a body of experts commissioned by the Washington State Legislature in 2000 to analyze the issues involved in monitoring salmon recovery. They recently published a paper entitled "Recommendations for Monitoring Salmonid Recovery in Washington State." That paper described the types of monitoring that would be needed to gauge recovery progress. The ISP posed three questions and postulated three types of monitoring to address those questions:

"1. Were management decisions, guidelines, programs, and restoration projects implemented?"

They suggested that **implementation monitoring** was the way to answer that question. They defined that type of monitoring as "...whether habitat projects were built as designed." They also added an adaptive management component in saying, with regard to projects, "...how they needed to be modified to accommodate site conditions revealed during construction are important to know for ensuring accountability and facilitating improvements in the future."

"2. Are the status and trends of populations and habitat characteristics achieving desired performance objectives?"

The ISP said that **effectiveness monitoring** could address that question. They said "...effectiveness monitoring for...salmonid recovery efforts should consist of science-based, issue-driven assessments of habitat protection and restoration projects and programs... Effectiveness monitoring should focus on every group of salmonids having identified recovery goals, and a subset of the habitat projects and programs. For salmonids, performance standards should be set at the population level, focusing on desired attributes of abundance, productivity, distribution, and diversity."

"Based on valid statistical designs...only a subset of habitat projects need to be included in overall effectiveness monitoring efforts. Different approaches will be needed for programs than will be needed for projects. It would be infeasible to require every individual habitat project to attempt to establish how many fish the project produced, for example. Performance standards for evaluating the effectiveness of habitat projects...can occur at different scales. Indicators used to monitor for the desired change should be chosen depending on the condition and scales the

projects...are intended to address. There is no single model for effectiveness monitoring. For projects, an effectiveness monitoring program might consist of well-designed studies of particular project types or restoration techniques, or the evaluation of several different approaches to a similar project, all drawing upon the available pool of projects of each category or type."

"3. Did management actions and restoration projects produce the desired change in conditions and status?"

Validation monitoring addresses this question, according to the ISP. "It tests the underlying assumptions behind the specific types of actions undertaken in... efforts to recover salmonids. Validation monitoring is needed to relate overall program efforts across all scales to progress toward achieving recovery objectives for individual ESUs and DPSs. Likewise, monitoring data collected in validation monitoring programs tailored to each ESU could be aggregated to evaluate performance of salmonid recovery efforts on a statewide basis."

"Validation monitoring should focus on testing specific hypotheses about the causal effects of actions necessary to achieve recovery. A fundamental question here is 'Are changes in population characteristics occurring only for salmonids in treatment areas (e.g., project streams or where management changes have been made), or are similar increases occurring in non-treatment areas?' A subset of projects and programs used for effectiveness monitoring can be used for validation monitoring. These should be chosen to maximize the power of opportunities to learn what works, what does not, and how to improve salmonid recovery efforts. Based on appropriate statistical designs, non-treatment areas (or times) should be identified and maintained during the experiment. Comparison of these with treatment areas (or times) is essential to infer that the changes were the result of management actions rather than chance, changing climate, or different oceanic conditions. Validation monitoring efforts should integrate information obtained from implementation and effectiveness monitoring programs, as well as long-term trend monitoring of salmonid abundance and habitat characteristics in index and reference reaches in specific areas, such as Water Resource Inventory Areas."

Clearly, the HCCC does not have the resources to undertake each of the three types of monitoring described above. However, we are anticipating beginning a program of implementation monitoring in conjunction with our project partners; the

design of an effectiveness monitoring program for the ESU; and the evaluation of what would be needed for validation monitoring.

The ISP additionally stated that there are **eight necessary elements to start and maintain a credible monitoring and adaptive management program.**

Those elements are:

- Clearly articulated goals, objectives, or questions that need to be addressed;
- Appropriate statistical designs;
- Indicators and variables based on needs defined by objectives and the appropriate geographical, temporal, biological scales;
- Monitoring protocols are standardized to allow comparison among locations, times, or programs;
- Programs are in place for quality assurance and quality control of the data (QA/QC);
- Data are managed to allow easy access and coordination among different collectors and users;
- Funding is stable and adequate to allow planning and implementation of sustained long-term efforts; and
- The information is analyzed and integrated into decision-making.”

Again, some of these elements are not present within the HCCC and the Summer Chum ESU, however we must begin to work with the elements that are present and on obtaining those elements that we can obtain, knowing that the others will be coming from state and federal sources in the future. The sooner we act now, however, the further ahead we will be when additional information and resources become available.

In the short run, and on an individual project sponsor level, when planning a project or taking an action there are several questions that we must ask ourselves. The level of confidence that we have when answering those questions gives us an

indication of how much we know about the relationship between the habitat we are addressing and the fish populations we hope to aid. Some of those questions are listed in the table at right.

Area Wide, Single Agency Priority Problems

Within the Hood Canal and the Eastern Strait of Juan de Fuca there are numerous problems that effect salmonids on a localized basis. Those problems must be addressed on a local scale. There are also some problems that are “regional” in nature and must be addressed by a single agency or concern. These problems cross watershed, county and WRIA boundaries. They pose special challenges for those engaged in salmon recovery efforts. These problems are physically large, very costly and complicated to address. Nonetheless, they can and must be addressed, and when they are, their remediation will post huge gains for listed as well as all other salmonids in the Hood Canal and Eastern Strait of Juan de Fuca.

Two of these currently identified high priority regional problems are:

- **Physical blockage, and limitation of function, of estuaries from river and stream mouths by earthen fill causeways supporting US Highway 101 along the west side of Hood Canal and along the eastern Strait of Juan de Fuca.** This problem impacts, to different degrees, the four major west side drainages identified as Tier I streams (the Skokomish, Hama Hama, Duckabush and Dosewallips Rivers) as well as streams throughout the lesser Tiers in this Strategy (Tier II: Lilliwaup; Tier III:; Snow and Salmon.) To address this problem, the Washington State Department of Transportation will need political support locally because of the disruptions to the public

Monitoring and Adaptive Management Table

Monitoring

- Can we adequately monitor our project/action to make sure that it continues to function as designed?
- Can we adequately monitor our project/action to make sure that it is positively benefiting fish and by how much?

Adaptive Management

- Was our project/activity designed to deliberately learn something new or to experiment?
- How will what we learn contribute to future project design or change our activities in the future?
- How will we catalog or archive that information and make it available for use by others; how do we make it non-proprietary?

Table 3

and local land owners that any realignment or reconstruction work would entail. WSDOT will also need political support and substantial amounts of funding from the State Legislature and the US Congress, because of the high costs of the various projects that would be required to address this issue, and because of the lower funding priority of Highway 101 relative to other much more highly traveled roadways in the state.

- **Sediment delivery to many major rivers and streams from erosion and mass wasting on US Forest Service roads.** This problem impacts streams all along the west side of Hood Canal (all four Tier I streams, as well as all Tier II and Tier III streams on the west side of the Canal and in the Eastern Strait.) To address this problem the US Forest service will need local political support to close many of the failing roads that are no longer used for logging access, and to upgrade and stabilize roads still used for resource protection and management, or for recreation. USFS will also need political support and substantial amounts of funding from the US Congress because of the high cost of this program. An adequate and stable budget for road maintenance is also needed to reduce risks of sedimentation from inadequately maintained roads in the future.

Estuary & Marine Nearshore Areas¹

All salmon species must migrate through the nearshore during outmigration to the sea and immigration to spawn. Nearshore areas within Hood Canal and the Eastern Strait of Juan de Fuca support multiple species and stocks of salmon that originate here as well as from outside the area. The nearshore, and estuaries in particular, have been termed the life support system for juvenile salmon feeding, rearing and migrating (Healey 1982, Simenstad et al. 1982). Juvenile chum and Chinook are recognized as being fundamentally dependent on nearshore ecosystems. Those systems also directly support the feeding and immigration of adults. Currently, the nearshore is increasingly understood as a critical, year-round habitat for salmon, not just as an in and out migration environment as was thought in the past. Additionally, nearshore areas here support forage fish such as surf smelt, sand lance and herring. Those fish are critical prey for salmon.

There are many ways of conceptualizing or defining the marine nearshore and estuary environments. One definition of nearshore applied to the Puget Sound-

Georgia Basin has the nearshore beginning at 200 feet upland of ordinary high-water and extending seaward to a depth of 65 feet below mean low water (Lynn 1998). This gives a physical sense of scale but is not descriptive. In looking at physical elements, nearshore habitats include: eelgrass meadows; kelp forests; sand and mudflats; tidal marshes, river mouths and deltas; sand spits, beach and backshore areas; banks and bluffs; and marine riparian areas (Dethier 1990.)

These habitats are described in further detail by Williams and Thom (2001).

Eelgrass is a marine plant that forms in small patches to large meadows in the low intertidal and shallow subtidal zone in both estuaries and protected nearshore marine habitats. Juvenile salmonids may use eelgrass for feeding and rearing; and herring use eelgrass as a spawning substrate. **Bull Kelp** is a brown alga that forms small patches to large forests in the shallow subtidal zone in Puget Sound. Its provides refuge and feeding habitat for fishes, spawning substrate for herring, and buffering of wave and current energy. **Flats, Sand Spits, Beaches, and Backshore Habitats** (and lagoons) are generally comprised of gentle slopes with a mixture of substrate including mud mixed with organics, sand, gravel, and/or cobble. Sand and mudflats provide a number of functions including prey production for juvenile salmon. Large woody debris may accumulate in backshore areas and beaches at extreme high tides, and can help stabilize the shoreline. It is believed that this debris provides foraging, refuge, and spawning substrate for fishes. **Tidal Marshes and Channels** are either directly connected to or predominantly isolated from watershed sediment processes and freshwater flows. They function similarly to wetlands. Juvenile salmon have been shown to reside in both tidal marshes and channels. **Banks and Bluffs (cliffs)** are steeply sloped areas located between the intertidal zone and the upland. They can be comprised of sediments of varying grain sizes, as well as rocks and boulders. They are important for sediment recruitment to the marine environment. **Marine Riparian Habitats** are characterized by dense vegetation and occur at the interface between terrestrial and aquatic ecosystems.

Descriptions of these physical components are helpful in articulating what comprises the nearshore and estuary environment; however, we must also consider the

1 - Extensive portions of this section were incorporated or paraphrased from the *HCCC-NOPLEG Nearshore Framework* document, Cambalik, et al. 2001.

processes that are integral to those environments. Those processes are: primary productivity; secondary productivity; organic matter flow; nutrient cycling; sediment processes (erosion, transport, deposition and storage); and hydraulic processes (tides, currents, rainfall, runoff, riverflows, groundwater movement, etc).

Primary productivity refers to production by plants of organic compounds that supply energy for the food web. It is driven by light, nitrates and phosphates.

Secondary productivity refers to the growth of small animals (primary consumers) many of which are salmon prey. **Organic matter flow** refers to the movement of plant and animal material (live, decaying or dead) within the ecosystem. **Nutrient cycling** involves the breakdown of organic nitrogen and other nutrients required for primary producers. **Sediment processes** include the erosion, transport, deposition, and storage of sediments, soils and cobbles. **Hydraulic processes** refer to tides, waves, currents and storm events.

From that ecosystem functional viewpoint, the inland extent of nearshore encompasses any habitat that is tidally influenced or brackish. The offshore extent is more variable from locale to locale. In some areas it could extend to the lower limit of the photic zone (approximately 30 feet below MLLW). In other areas it could extend much further (many miles, in some cases.)

In a general sense, it is recognized that undeveloped shoreline segments likely have higher value due to the presence of intact vegetation and the absence of shoreline modifications and hardening. Similarly, many opportunities exist in select areas for active restoration work such as the removal of shoreline armoring, tidegates, and fill materials to return those areas to as much natural function and as near original physical structure as possible.

Currently, we lack adequate information to be able to either physically or functionally map areas in a simple geographic fashion that would allow us to prioritize them for either preservation or restoration action. Since this is the case, we have adopted a conservative interim approach that prioritizes all marine nearshore in Tier I of our Strategy for restoration and protection.

We have also included all estuaries in Tier I of our Strategy. Those estuaries are included for all rivers and streams to their height of tide. We did this because it is known that juvenile salmonids access and use small creek mouths and shallow

water shoreline areas, beyond their natal watersheds, for extended periods. It is believed that they do this throughout the Canal and Strait.

We expect that as more studies and analysis of our marine shorelines and estuaries are completed we will be able to geographically prioritize those areas for their importance to salmon.

Conclusion

This strategy tries to recognize those different local groups and agencies have different mandates, agendas and desires. But, using an overall strategy will help put those different activities into a larger perspective. It will also help balance efforts to make sure that areas with the highest productive potential and species diversity are not ignored or missed because of lack of coordination among the numerous groups working on salmon recovery through different funding sources.

Independent Anadromous Drainages to Hood Canal & the Eastern Strait of Juan De Fuca:

Jefferson County/WRIA 17 Drainages Page 20

Salmon Creek 17.0245
Snow Creek 17.0219
Andrews Creek 17.0221
Crocker Lake
Chimacum Creek 17.0203
Naylor's Creek 17.0208
Little Goose Creek 17.0200A
Piddling Creek 17.0200
Ludlow Creek 17.0192
Unnamed 17.0191
Shine Creek 17.0181
Bones/Hubbard Creek 17.0180
Thorndyke Creek 17.0170
Fisherman Harbor Creek 17.0153
Camp Discovery Creek 17.0141
Tarboo Creek 17.0129
Jakeway Creek 17.0116
Donovan Creek 17.0115
Little Quilcene River 17.0076
Leland Creek 17.0077
Lake Leland
Big Quilcene River 17.0012
Penny Creek 17.0014
Indian George Creek 17.0011
Spencer Creek 17.0004
Marple Creek 17.0001

Jefferson County/WRIA 16 Drainages Page 39

Turner Creek 16.0559
Dosewallips River 16.0440
Walker Creek 16.0441
Duckabush River 16.0351
McDonald Creek 16.0349
Fulton Creek 16.0332
Schaerer Creek 16.0326
Waketick Creek 16.0318

Mason County/WRIA 16 Drainages Page 45

Hama Hama River 16.0251
Jorsted Creek 16.0248
Eagle Creek 16.0243
Lilliwap Creek 16.0230
Little Lilliwap Creek 16.0228
Sund Creek 16.0226
Miller Creek 16.0225
Clark Creek 16.0224
Finch Creek 16.0222
Hill Creek 16.0221
Enatai Creek 16.0216
Minerva Creek 16.0215
Skokomish River 16.0001
North Fork Skokomish River 16.0001
Purdy Creek 16.0005
Weaver Creek 16.0006
Hunter Creek 16.0007
South Fork Skokomish River 16.0011
Richert Springs 16.0010
Vance Creek 16.0013

**Mason County/WRIA 14 Drainages
Page 55**

Alderbrook/Big Bend Creek	14.0138
Twano Creek	14.0134
Unnamed Creek	14.0133
Forest Beach Creek	14.0132
Unnamed Creek	14.0131
Unnamed Creek	14.0130
Happy Hollow Creek	14.0129
Unnamed Creek	14.0128
Holyoke Creek	14.0127
Lakewood Creek	14.0126
Devereaux Creek	14.0124

**Mason County/WRIA 15 Drainages
Page 62**

Sweetwater Creek	15.0505
Union River	15.0503
Big Mission Creek	15.0495
Little Mission Creek	15.0493
Johnson Creek	15.0492
Hall Creek	15.0491
Stimson Creek	15.0488
Unnamed Creek	15.0486
Unnamed Creek	15.0485
Cady Creek	15.0484
Little Shoofly Creek	15.0482
Shoofly Creek	15.0478
Tahuya River	15.0446
Caldervin Creek	15.0445
Brown Creek	15.0044
Rendsland Creek	15.0439
Don Lake Creek	15.0438
Dewatto River	15.0420

**Kitsap County/WRIA 15 Drainages
Page 75**

Big Anderson Creek	15.0412
Harding Creek	15.0408
Nellita Creek	15.0407A
Boyce Creek	15.0407
Stavis Creek	15.0404
Seabeck Creek	15.0400
Little Beef Creek	15.0399
Big Beef Creek	15.0389
Johnson Creek	15.0387
Little Anderson Creek	15.0377
Cattail Lake Creek	15.0370
Jump-Off-Joe Creek	15.0369
Cougar Creek	15.0367
Gamble Creek	15.0356
Martha John Creek	15.0354

JEFFERSON COUNTY/WRIA 17 DRAINAGES

SALMON CREEK – WRIA 17.0245

Description: Salmon Creek flows from the north slopes of Mount Zion into Discovery Bay at the eastern edge of the Strait of Juan de Fuca, adjacent to Snow Creek. The watershed is approximately 15,150 acres (nearly 24 square miles). Historically, Salmon and Snow Creeks merged a short distance before they entered Discovery Bay. Currently, the Salmon and Snow Creeks entry into the estuarine area of Discovery Bay is constrained by the Highway 101 bridges and the elevated rail-road grade.

Stock Status: **Federally listed** (threatened) – summer chum
Critical – coho (1992 SASSI)
Depressed – winter steelhead (1992 SASSI)

Land Use: Land use within Salmon Creek is primarily Olympic National Forest (9,230 acres) and privately held forest lands (5,052 acres). Due to budgetary constraints, the USFS has not been able to properly maintain and/or decommission forest roads, thereby increasing the threat of future sedimentation problems. There is a mixture of agriculture (219 acres) and rural residential (613 acres) in the lower watershed, with about 10 acres zoned for commercial uses located at the mouths of Snow and Salmon creeks along Highway 101 at the marine shoreline of Discovery Bay. The predominant residential zoning in this watershed (593 acres) is one residence per 20 acres.



Figure 2

Factors for Decline:

Protection/Restoration Activities Completed: Wild Olympic Salmon summer chum stock restoration project (1992-2004) funded by WOS, Governor's Salmon Office and North Olympic Salmon Coalition; Jefferson County Conservation District widened the flood plain through 1200 feet of the lower reach, funded in part by NOSC and installed 1540 feet of livestock exclusion fencing.

Protection/Restoration Activities In Progress: Funding has been awarded to WDFW for lower mainstem/estuary acquisitions. JCCD received SRFB and NOSC funding to restore natural riverine function.

Sequenced Project List:

1. Provide protection through acquisition or easements of high quality habitats
2. Restore natural riverine functions
Note: Acquisition or conservation easements may be needed to accomplish the following restoration activities
 - a. Abate Houck Creek sedimentation
 - b. Remove WDFW weir
 - c. Remove rip rap
 - d. Restore sinuosity
 - e. Large woody debris/stable log jams
 - f. Riparian plantings
 - g. Riparian fencing
3. Re-establish functional estuary-freshwater link
Note: Acquisition or conservation easements may be needed to accomplish the following activities
 - a. Assess estuary rearing habitat condition
 - b. Remove railroad grade
 - c. Evaluate the effects of the Highway 101 bridge
4. Assess, stabilize, monitor fine sediment sources
 - a. Identify, abate and monitor sediment sources
 - b. Maintain roads in upstream forest areas
 - c. Spawning gravel composition study
5. Assess scour and deposition
6. Assess flows (WRIA 17 Planning Unit)
 - a. Peak - assess channel ability to accommodate peak flood flows
 - b. Low
 1. Assess surface/groundwater withdrawals for impact on low flows
 2. Assess instream flow; consider ways to increase instream flows

SNOW CREEK – WRIA 17.0219

See Salmon Creek – WRIA 17.0245, page 20 for map

Description: Snow Creek flows from the northeast and east slopes of Mount Zion into Discovery Bay at the eastern edge of the Strait of Juan de Fuca. The watershed comprises a total of approximately 14,395 acres (about 22.5 square miles).

Stock Status: **Federally listed** (threatened) – summer chum
Critical – coho (1992 SASSI)
Depressed – winter steelhead (1992 SASSI)

Land Use: Land use within the Snow Creek Watershed is similar to the Salmon Creek watershed, with additional rural residential land use in the lower watershed. The Olympic National Forest comprises 5,502 acres (38% of the watershed), and privately-held forest lands comprise 7,280 (51% of the watershed). Due to budgetary constraints, the USFS has not been able to properly maintain and/or decommission forest roads, thereby increasing the threat of future sedimentation problems. Rural residential is zoned in 1,120 acres, with 191 acres of zoned agricultural land. There are about 10 acres of land zoned for commercial use located at the mouths of Snow and Salmon creeks along the shoreline of Discovery Bay. The predominant residential zoning in this watershed (650 acres) is one residence per 20 acres.

Factors for Decline:

Protection/Restoration Activities Completed: Jefferson County Conservation District and Wild Olympic Salmon/Jobs for the Environment restored sinuosity and complexity to lower mile of Snow Creek and planted riparian area, funded by JFE program and North Olympic Salmon Coalition; JCCD and WOS/JFE completed 4192 feet of stock exclusion fencing projects, funded by JFE and NOSC, including 0.5 acres riparian planting; WDFW and WOS are rebuilding coho populations, RSIs funded by NOSC

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Restore estuary function/re-establish functional estuary-freshwater link
Note: Acquisition or conservation easements may be needed to accomplish the following activities
 - a. Provide protection by acquisition (or easements) of tidelands
 - b. Study re-integration of estuary with Snow Creek

- c. Remove railroad grade
- d. Study re-establishing the link with Salmon Creek
- e. Evaluate/abate the impacts of the Highway 101 bridge
- f. Remove dikes and fill
- g. Assess estuary rearing habitat conditions
- 2. Restore natural riparian/riverine functions
 - Note: Acquisition or conservation easements may be needed to accomplish the following restoration activities*
 - a. Remove channel constrictions
 - b. Restore sinuosity
 - c. Large woody debris/create stable, long-term log jams
 - d. Riparian plantings
 - e. Riparian fencing
 - f. Construct over-wintering habitat off channel or within the flood plain
 - g. Maintain/modify WDFW weir
- 3. Provide protection by acquisition (or easement) of high quality habitat
- 4. Assess, stabilize, monitor fine sediment sources
 - a. Reduce excess sediment input or increase the movement of sediment through the system
 - b. Evaluate and control the impacts of road maintenance in watershed
 - c. Assess and restore the debris jam & slide areas
 - d. Evaluate/address the impacts of Highway 101/104 junction storm drain
- 5. Assess scour and deposition
- 6. Assess flows (WRIA 17 Planning Unit)
 - a. Peak - assess channel ability to accommodate peak flood flows
 - b. Low flows -
 - 1. Assess surface/groundwater withdrawals for impact on low flows
 - 2. Assess instream flow; consider ways to increase instream flows

Andrews Creek – WRIA 15.0221, tributary to Snow Creek

Description: Flows into Crocker Lake, then Snow Creek

Stock Status: Coho, cutthroat

Land Use: Rural residential, agriculture

Factors for Decline:

Protection/Restoration Activities Completed: Washington State Department of Transportation Jefferson County Conservation District and Wild Olympic Salmon/Jobs for the Environment added sinuosity and complexity to 4000 feet of the reach along US Hwy 101, installed 4895 feet of stock exclusion fencing and planted 4.1 acres of riparian zone.

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Restore sinuosity
2. Add LWD
3. Revegetate riparian area

Crocker Lake, tributary to Snow Creek

Description: Flows into Snow Creek

Stock Status: Coho (stock restoration currently underway by WDFW and WOS),
Cutthroat

Land Use: Rural Residential

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Fix beaver dam passage barrier on the outlet from Crocker Lake
2. Control reed canary grass at outlet from Crocker Lake

NOTE: Storm drainage and erosion impacts from the creek that drains the south side of Hwy 104 and flows into the east side of Crocker Lake

CHIMACUM CREEK – WRIA 17.0203

Description: drains into Port Townsend Bay at the NW portion of Admiralty Inlet, about 5 mi south of City of Port Townsend. The Chimacum watershed is approximately 22,347 acres (about 35 square miles), draining the majority of the Quimper Peninsula.

Stock Status: Federally listed (threatened) – summer chum
Healthy – coho (1992 SASSI)

Land Use: The upper watershed is composed of agricultural, forestry, and rural residential. Overall, there are 3,046 acres zoned for agriculture in the watershed, representing about 14% of the total watershed area. Toward the lower reaches, Chimacum Creek flows through more residential and commercial land uses. Rural residential zoning is found in about 8,528 acres (38% of the watershed). A total of 152 acres of land is zoned commercial (0.7% of the total). The predominant residential zoning in this watershed (4,112 acres) is one residence per 20 acres.

Factors for Decline:

Protection/Restoration Activities Completed: Mainstem (West Fork) and Tribs: Jefferson County Conservation District and Wild Olympic Salmon/Jobs for the Environment installed 41,650 feet of stock exclusion fencing, provided sinuosity and complexity to 2476 feet and planted over 3 acres in riparian zone, funded by JFE and North Olympic Salmon Coalition; East Fork and Tribs: WOS/JFE replaced a culvert, provided sinuosity and complexity to 3077 feet, installed livestock exclusion fencing along 6609 feet of the creek and planted 9 acres in riparian zone, funded by JFE, USDA and NOSC.

Protection/Restoration Activities Underway: SRFB funding has been awarded to WDFW for restoration of the nearshore area and to NOSC and JCCD to restore natural riverine function through the agricultural and urbanizing areas upstream.



Figure 3

Sequenced Project List:

1. Restore natural riverine functions
Note: Acquisition or conservation easements may be needed to accomplish the following restoration activities
 - a. Restore sinuosity
 - b. Re-establish riparian plantings
 - c. Restore complexity
 - d. Restore wetlands and beaver ponds
 - e. Control reed canary grass
 - f. Long-term maintenance of planting and fencing
 - g. Fish passage barriers in mainstem
2. Restore estuary/nearshore function
Note: Acquisition or conservation easements of tidelands, estuary and nearshore habitats may be needed to accomplish the following activities
 - a. Restore tidal delta, estuary and nearshore habitats, ie remove fill
 - b. Assess estuary rearing habitat conditions
3. Provide protection of high quality habitat through acquisition or conservation easement
4. Assess/monitor water quality and habitat conditions
 - a. Assess, stabilize, monitor fine sediment sources
 - b. Assess coliform & dissolved oxygen
 - c. Monitor temperature
 - d. Monitor water quality impacts of urbanization
 - e. ContinueTFW ambient monitoring & mapping
5. Flow
 - a. Assess surface/ground water withdrawals for impact on summer low flow
 - b. Stream gauge below Chimacum to monitor effects of urbanization
 1. Locate, monitor runoff sources
 2. Monitor potential impacts from peak flows with scour chains, ie redds

Naylor's Creek – WRIA 17.0208, tributary to Chimacum Creek

Description: Flows into Chimacum Creek at River Mile 5.4. Flows go subsurface during summer low flows

Stock Status: Coho, cutthroat

Land Use: Rural residential, agriculture

Factors for Decline:

Protection/Restoration Activities Completed: JCCD and WOS/JFE replaced one culvert, installed 5523 feet of livestock exclusion fencing and planted 0.3 acres riparian zone

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Restore sinuosity
2. Replace county road culvert on West Valley Road
(PI value: 26.91, ranked 9/84)

LITTLE GOOSE CREEK – WRIA 17.0200A

Description: flows into the northwest end of Oak Bay

Stock Status: coho

Land Use: Rural residential; forestry

Factors for Decline:

Protection/Restoration Activities Completed: JCCD and WOS/NOSC provided 200 feet of stream restoration.

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Maintain fish passage through county culvert at Oak Bay Road
(PI value 10.93, ranked 31/84)

PIDDLING CREEK – WRIA 17.0200

Description: flows into Mats Mats Bay just south of Bayshore Road

Stock Status:

Land Use: Rural residential; forestry

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Restore fish passage at culvert on Oak Bay Road
(PI value 9.53, ranked 36/84)

LUDLOW CREEK – WRIA 17.0192

Description: flows into Port Ludlow Harbor southwest of the marina. The anadromous reach is about 0.5 miles in length due to a rarely passable cascade/falls.

Stock Status: coho, fall chum (volunteer surveys)

Land Use: residential, forestry, golf course

Factors for Decline:

Protection/Restoration Activities Completed: Wild Olympic Salmon monitors spawning fish populations each fall/winter

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Increase span on Paradise Bay Road to restore estuary function

UNNAMED CREEK – WRIA 17.0191

Description: tightly constrained through lower reach due riprap and lawns

Stock Status: unknown

Land Use: residential, forestry

Factors for Decline:

Protection/Restoration Activities Completed: None

Protection/Restoration Activities Underway:

Sequenced Project List:

SHINE CREEK – WRIA 17.0181

Description: Flows from forested wetlands southward and eastward and eventually through a large beaver pond to its estuary in Squamish Harbor

Stock Status: Coho (Wild Olympic Salmon observations)

Land Use: Forestry

Factors for Decline:

Protection/Restoration Activities Completed: Streambed stabilization adjacent to Hwy 104 (WOS)

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Address siltation of right bank trib running along the south side of Hwy 104
2. Restore estuary function by widening crossing span on South Point Road

BONES/HUBBARD CREEK – WRIA 17.0180

Description: Small stream flowing through forested/residential area. Lower reach has been constricted with riprap

Stock Status: Coho (Port Gamble tribal biologist observations)

Land Use: Forestry, rural residential

Factors for Decline:

Protection/Restoration Activities Completed: Streambed stabilization, LWD placement; Passage improvements (PGST with HCSEG funding)

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Address erosion problem on south embankment of Hwy 104

THORNDYKE CREEK – WRIA 17.0170

Description: Most of the watershed is owned by Olympic Resources, and is in long term forestry.

Stock Status: Coho, fall chum

Land Use: Forestry, rural residential

Factors for Decline:

Protection/Restoration Activities Completed: Four culverts have been replaced on Olympic Resources lands; WOS incubated fall chum in two RSI's for several years (terminated brood year 2000)

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Replace culvert on Thorndyke Road at milepost 4.71
(PI value of 39.04, ranked 2/84)
2. Underplant riparian with conifer

FISHERMAN HARBOR CREEK – WRIA 17.0153

Description: Flows into Hood Canal at the southern end of Toandos Peninsula

Stock Status: Fall chum (local observations)

Land Use: Rural residential; forestry

Factors for Decline:

Protection/Restoration Activities Completed: None

Protection/Restoration Activities Underway:

Sequenced Project List:

CAMP DISCOVERY CREEK – WRIA 17.0141

Description:

Stock Status: Coho (Port Gamble tribal biologist observations)

Land Use: Forestry, rural residential

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

TARBOO CREEK - WRIA 17.0129

Description: Tarboo Creek drains into Tarboo Bay at the head of Dabob Bay on the west side of the Toandos Peninsula. Tarboo Creek was not discussed in detail in the Summer Chum Habitat Recovery Plan. Nor did the NMFS chinook Status Review did not mention Tarboo Creek. The creek is not reported to support Hood Canal summer chum or Puget Sound chinook, but may have contained habitat for summer chum and chinook that contributed to the fisheries resource in the past.

Stock Status: **Depressed** — coho (1992 SASSI)
 Unknown — winter steelhead (1992 SASSI)

Land Use: The land use in the Tarboo Creek watershed has not been analyzed in detail. The majority of the land use is within commercial forestry, rural forestry, and in-holding forestry land use zones. There are no forest lands under federal ownership in this watershed. The primary residential land use is one dwelling unit per twenty acres.

Factors for Decline:

Protection/Restoration Activities Completed: Part of the lower watershed, with its intact riparian zone is protected in WDFW ownership; Jefferson County Conservation District and Wild Olympic Salmon/Jobs for the Environment Crew have installed 18,570 feet of livestock exclusion fencing, restored natural riverine function to 1670 feet and planted 2 acres in riparian zone, funded by JCCD, JFE and NOSC.

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Address blocking culverts: Center Road (PI value 39.08, ranked 1/84); Dabob Road (PI value 35.78, ranked 3/84), Old Tarboo Road (PI value 32.76, ranked 4/84), Coyle Road, E.F. (PI value 26.81, ranked 10/84); Coyle Road, E.F. (PI value 17.68, ranked 19/84)

2. Restore natural riverine function
 - a. Add channel sinuosity
 - b. Restore complexity, such as LWD
 - c. Riparian planting
3. Create access to pond

JAKEWAY CREEK - WRIA 17.0116

Description:

Stock Status: Coho (local observations)

Land Use: Forestry, agriculture

Protection/Restoration Activities Completed: WOS/JFE and JCCD restored 1050 feet of natural riverine function and installed 3144 feet of livestock exclusion fencing

Protection/Restoration Activities Underway:

Sequenced Project List:

DONOVAN CREEK – WRIA17.0115

Description:

Stock Status:

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed: JCCD and WOS/JFE installed 6700 feet of livestock exclusion fencing.

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Restore tidal flux
2. Remeander stream
3. Add LWD
4. Plant riparian area
5. Convert fill roadways to pile causeways

LITTLE QUILCENE RIVER - WRIA 17.0076

Description: The Little Quilcene drains into Quilcene Bay north of the Big Quilcene River. The watershed comprises 22,512 acres (about 35 square miles) in the north-eastern corner of the Olympic Mountains and adjacent lowlands.

Stock Status: **Federally listed** (threatened) – summer chum
Depressed – coho (1992 SASSI)
Unknown – winter steelhead (1992 SASSI)

Land Use: The Little Quilcene watershed is less protected than many other Hood Canal rivers. None of the watershed is located within Olympic National Park, although major portions of the watershed are located within the Olympic National Forest. About 9,872 acres (44% of the total watershed) is within the Olympic National Forest, and another 8,224 acres (36% of the total watershed) is zoned for privately-held forest land. There are 3,840 acres of rural residential zoning in the Little Quilcene watershed, 180 acres of agriculture, and five acres of commercially-zoned lands. The predominant residential zoning in this watershed (2,263 acres) is one residence per 20 acres.

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

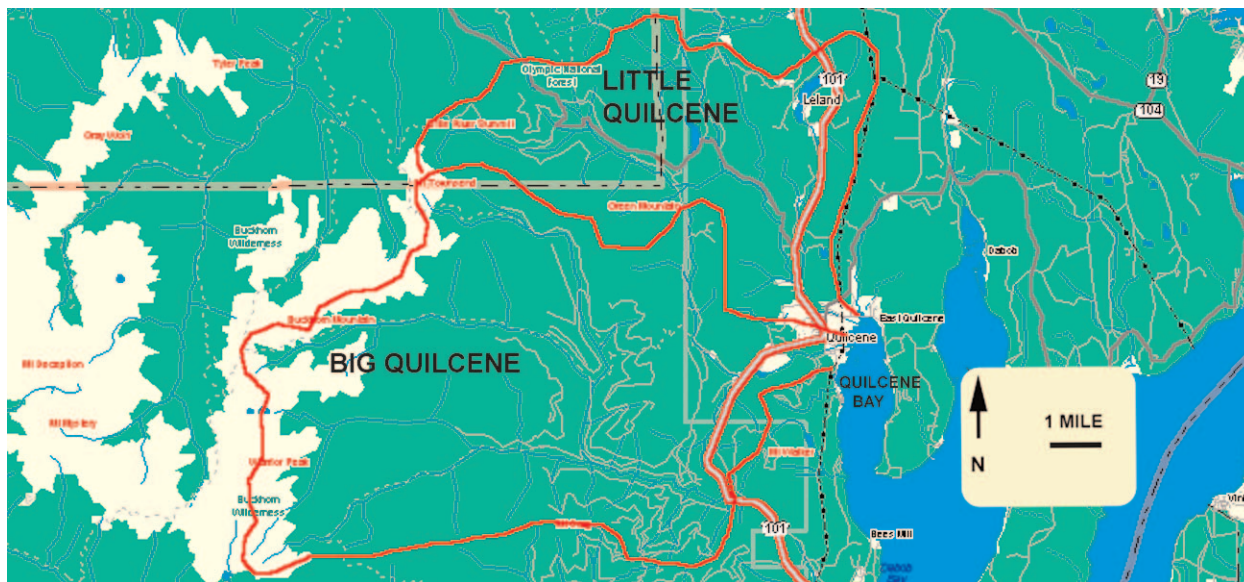


Figure 4

Sequenced Project List:

1. Restore estuary function /reestablish functional estuary-freshwater link
NOTE: Acquisition and/or conservation easements might be needed to accomplish the following activities:
 - a. Restore north Little Quilcene salt marsh/tidal prism
 - b. Restore south Little Quilcene salt marsh/tidal prism
 - c. Restore estuarine diked areas
 - c. Evaluate relative effect of road fill causeways on the creation and maintenance of tidal sloughs
2. Protect and restore natural riverine functions
 - a. Acquire property or easements
 - b. Remove dikes
 - c. Restore channel sinuosity
 - d. Update floodplain and channel migration maps
 - e. Add complexity such as LWD
3. Assess, stabilize, monitor sediment sources
4. Hydrologic & flow studies (WRIA 17 Planning Unit)
 - a. Assess hydrologic continuity between groundwater and surface water
 - b. Build watershed hydrologic model
 - c. Assess minimum necessary summer low flow

Leland Creek - WRIA 17.0077, tributary to Little Quilcene River

Description:

Stock Status:

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed: JCCD installed 2323 feet of livestock exclusion fencing

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Replace unnamed trib culvert under Leland Valley Rd. W. (PI value 14.52, ranked 22/84, design work has been completed by Jefferson County)
2. Address reed canary grass problem

Lake Leland

Description:

Stock Status:

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Address reed canary grass problem

BIG QUILCENE RIVER - WRIA 17.0012

See Little Quilcene River – WRIA 17.0076, page 33 for map

Description: The Big Quilcene River drains into Quilcene Bay near the Little Quilcene River, located in the northwest portion of Hood Canal. The Big Quilcene River has a watershed area of about 44,786 acres (about 70 square miles). Eighty-five percent of the watershed is in federal ownership in national forest. The Buckhorn Wilderness Area occupies about 30% of the watershed.

Stock Status: **Federally listed** (threatened) – summer chum, chinook
 Depressed – coho (1992 SASSI)
 Healthy – late fall chum (1992 SASSI)
 Unknown – winter steelhead (1992 SASSI)

Land Use: The community of Quilcene is located in, and adjacent to, the 100-year floodplain of the Big Quilcene River. Rural residential zoning occupies approximately 4% of the watershed. Commercial zoning occupies a total of 48 acres (0.1% of the watershed). There are 22 acres of light industrial zoning located just outside of the Quilcene “downtown-core” community. The predominant residential zoning in this watershed (979 acres) is one residence per five acres.

Factors for Decline:

Protection/Restoration Activities Completed: Jefferson County Conservation District and Wild Olympic Salmon/Jobs for the Environment Crew installed 500 feet of livestock exclusion fencing, restored natural riverine function in 2800 feet of river and planted 0.2 acres in riparian zone.

Protection/Restoration Activities Underway: Jefferson County received SRFB funding to assess lower river/estuary habitats and develop prioritized list for habitat restoration projects.

Sequenced Project List:

1. Protect and restore natural processes in lower river and estuary
NOTE: Acquisition or conservation easements may be needed to accomplish the following restoration activities
 - a. Address dike and road impacts in lower reach
 - b. Restore sinuosity
 - c. Reestablish functional estuary/freshwater link
 - d. Address artificially aggraded delta cone sediments
2. Protect and restore riverine function above River Mile 1
 - a. Restore channel complexity (LWD) and sinuosity
 - b. Protect intact riparian forest
 - c. Restore fish passage above hatchery weir
3. Monitor and address mass wasting, as per watershed analysis
 - a. Identify, abate and monitor sediment sources
 - b. Maintain roads in upstream forest areas
 - c. Quantify severity of scour problem
4. Hydrologic & flow studies (WRIA 17 Planning Unit)
 - a. Assess hydrologic continuity between groundwater and surface water
 - b. Build watershed hydrologic model
 - c. Assess minimum necessary summer low flow
 - d. Address summer low flow

Penny Creek - WRIA 17.0014, tributary to the Big Quilcene River

Description:

Stock Status:

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Assess diversion/culvert modification for passage

INDIAN GEORGE CREEK - WRIA 17.0011

Description: Small independent tributary to the west side of Quilcene Bay just south of the Big Quilcene River. The estuary is in public ownership (Washington Department of Fish and Wildlife) for the purpose of shellfish harvest.

Stock Status: Coho (local observation)

Land Use: Forestry, rural residential

Factors for Decline:

Protection/Restoration Activities Completed: Restore channel complexity along 623 feet of lower stream (Wild Olympic Salmon/Jobs for the Environment Crew, Jefferson Conservation District)

Protection/Restoration Activities Underway: WDFW/Hood Canal Salmon Enhancement Group received SRFB, ALEA and NWFOW funding for estuary restoration

Sequenced Project List:

1. Restore estuary function (funded late 2000 SRFB; construction planned 2001)
 - a. Remove fill and barges on WDFW property
2. Restore riparian

SPENCER CREEK - WRIA 17.0004

Description:

Stock Status: Fall chum, coho (local observation)

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Address sediment inputs

MARPLE CREEK - WRIA 17.0001

Description:

Stock Status:

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

JEFFERSON COUNTY/WRIA 16 DRAINAGES

TURNER CREEK - WRIA 16.0559

Description:

Stock Status:

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

DOSEWALLIPS RIVER - WRIA 16.0440

Description: The Dosewallips River is the largest river in east Jefferson County within the Hood Canal summer chum and Puget Sound chinook ESU. The Dosewallips River flows into the Hood Canal from the Olympic Mountains, draining a watershed area of approximately 74,412 acres (approximately 116 square miles) and with an average annual discharge of 446 cubic feet per second at river mile 7.1.

Stock Status: **Federally listed** (threatened) – summer chum, chinook
Healthy – late fall chum, coho (1992 (SASSI))
Depressed – pinks, winter steelhead (1992 SASSI)

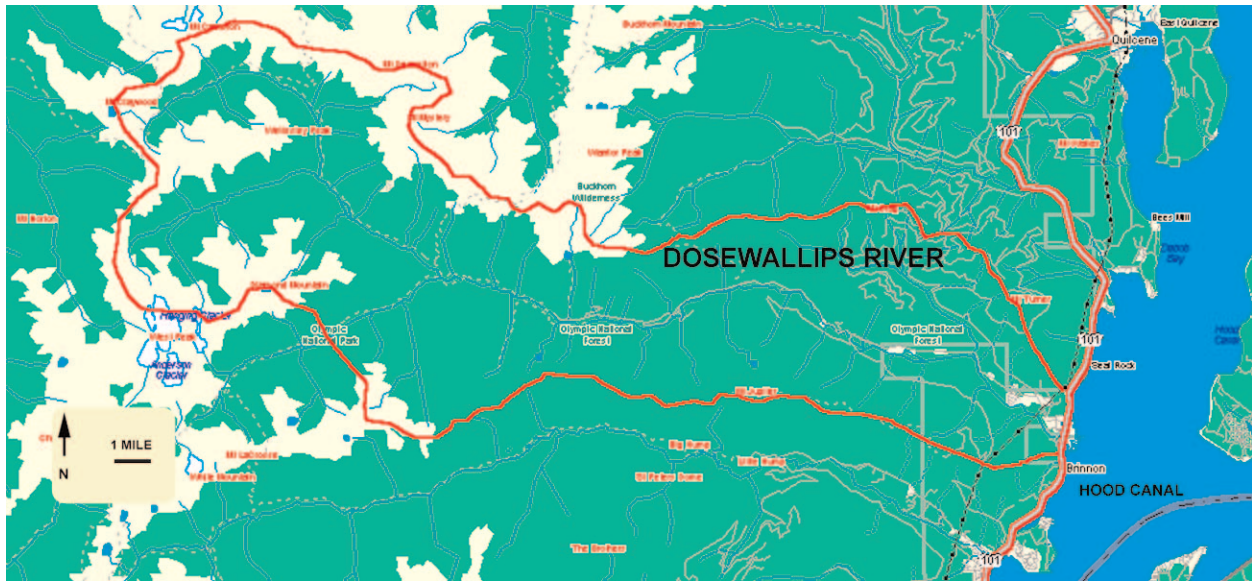


Figure 5

Land Use: The largest landowners in the Dosewallips River watershed are the Olympic National Park (47,231 acres) and the Olympic National Forest (22,028 acres), which, together, comprise 93% of the watershed. A significant portion of the National Forest land is protected as wilderness area. Due to budgetary constraints, however, the USFS has not been able to properly maintain and/or decommission forest roads, thereby increasing the threat of future sedimentation problems. The remaining 7% is divided between privately-held forest lands, rural residential, park land and commercial uses. There are 34 acres of commercial zoning in the watershed, which is concentrated in the lower reaches. The predominant residential zoning in this watershed (678 acres) is one residence per 20 acres. The rural village center of Brinnon is located at the mouth of the river.

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway: Hood Canal Salmon Enhancement Group received SRFB and NFWF funding to assess Highway 101 causeway impacts on the historic estuary/tidal channels

Sequenced Project List:

1. Protect and restore estuary function
NOTE: Acquisition or conservation easements may be needed to accomplish the following restoration activities
 - a. Assess/restore constriction at Highway 101 causeway
 - b. Restore tidal process
 - c. Reconnect tidal channels/wetlands
2. Protection of high quality habitat through acquisition or conservation easements
 - a. Target properties in lower floodplain and channel migration zone (lower 3.0 river miles)
 - b. Target estuary properties
3. Restore natural riverine function
NOTE: Acquisition or conservation easements may be needed to accomplish the following restoration activities
 - a. Restore sinuosity and complexity (LWD) in channelized reaches
 - b. Add LWD between Lazy C and mouth
 - c. Identify/abate sediment sources, ie USFS roads
 - d. Plant riparian zone
 - e. Evaluate passage/road crossings

4. Watershed assessment
 - Complete refugia study (funded late 2000 by SRFB)
 - Complete Ecosystem Diagnosis and Treatment (EDT) (waiting for analysis)
 - Conduct Limiting Factors Analysis (LFA) (scheduled to begin spring 2001)
 - Conduct habitat surveys of lower river

WALKER CREEK - 16.0441

Description: steep gradient

Stock Status: coho, chum present (Stream Guide)

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

DUCKABUSH RIVER - WRIA 16.0351

Description: The Duckabush River is along the southern boundary of Jefferson County with Mason County and is within the Hood Canal summer chum and the Puget Sound chinook ESU. The watershed comprises approximately 49,970 acres (about 78 square miles). The annual average discharge is 411 cubic feet per second at RM 4.9.

Stock Status: **Federally listed** (threatened) – summer chum, chinook
Depressed – coho, winter steelhead (1992 SASSI)
Healthy – late fall chum, pinks (1992 SASSI)

Land Use: The Duckabush River watershed is similar to that of the Dosewallips River. Approximately 28,875 acres are within Olympic National Park and 15,681 acres are within Olympic National Forest, together comprising 89% of the watershed area. Due to budgetary constraints, however, the USFS has not been able to properly

Factors for Decline:

Protection/Restoration Activities Underway: Hood Canal Salmon Enhancement Group received SRFB and NFWF funding to assess impacts of Highway 101 causeway on historic estuary/tidal channels

NOTE: Acquisition or conservation easements may be needed to accomplish the following restoration activities

-
- A detailed map of the Duckabush area in Washington state. The map shows the Olympic National Forest in green, Hood Canal in blue, and various towns and roads. A red line highlights a specific route. A scale bar indicates 1 mile, and a north arrow is present in the bottom left corner. Labels include 'Duckabush', 'Hood Canal', 'Olympic National Forest', 'Bellingham', 'Port Angeles', '101', '20', '30', '40', '50', '60', '70', '80', '90', '100', '110', '120', '130', '140', '150', '160', '170', '180', '190', '200', '210', '220', '230', '240', '250', '260', '270', '280', '290', '300', '310', '320', '330', '340', '350', '360', '370', '380', '390', '400', '410', '420', '430', '440', '450', '460', '470', '480', '490', '500', '510', '520', '530', '540', '550', '560', '570', '580', '590', '600', '610', '620', '630', '640', '650', '660', '670', '680', '690', '700', '710', '720', '730', '740', '750', '760', '770', '780', '790', '800', '810', '820', '830', '840', '850', '860', '870', '880', '890', '900', '910', '920', '930', '940', '950', '960', '970', '980', '990', '1000', '1010', '1020', '1030', '1040', '1050', '1060', '1070', '1080', '1090', '1100', '1110', '1120', '1130', '1140', '1150', '1160', '1170', '1180', '1190', '1200', '1210', '1220', '1230', '1240', '1250', '1260', 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42

- a. Restore sinuosity/complexity in lower 2.5 miles; assess/address bulkhead impacts
- b. Identify/abate sediment sources, i.e. USFS roads
- c. Assess/restore riparian
- 3. Watershed assessments
 - Conduct Limiting Factors Analysis (LFA) (scheduled to begin spring 2001)
 - Conduct Ecosystems Diagnosis and Treatment (EDT)(waiting for report)
 - Assess habitat of lower river

MCDONALD CREEK – WRIA 16.0349

Description: steep gradient

Stock Status: coho, chum present (Stream Guide)

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

FULTON CREEK – WRIA 16.0332

Description: steep gradient

Stock Status: coho, chum present (Stream Guide)

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

SCHAERER CREEK – WRIA 16.0326

Description: steep gradient

Stock Status: coho, chum present (Stream Guide)

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

WAKETICKEH CREEK – 16.0318

Description: 6.6 mainstem miles;

Stock Status: coho, chum present (Stream Guide)

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

MASON COUNTY/WRIA 16 DRAINAGES

HAMA HAMA RIVER – WRIA 16.0251

Description: watershed is about 85 square miles, with 18 miles mainstem and 93 miles of tributary habitat; anadromous species confined to lower 2 miles of mainstem and lower 1.8 miles of Johns Creek, a lower mainstem trib; two annual runoff peaks - one Nov-Feb due rains, one May-June due snow melt; originates east Olympic Mtns, flows east through steep forested terrain to Hood Canal at Eldon;

Stock Status: **Federally listed** (threatened) – summer chum, chinook

Healthy – fall chum, coho, pinks (1992 SASSI)

Unknown – winter steelhead (1992 SASSI)

NOTE: Captive brood programs for chinook, summer chum and winter steelhead are currently underway.

Land Use: 95% public ownership (60% managed forest, 34% national park or wilderness); 5% private (mainly commercial forest with some agriculture and residence in lower 1.5 miles)

Factors for Decline: lack of channel complexity; removal of LWD from 1950s to present; bed instability; sedimentation and aggradation in lower Johns Creek due landslides due road failures and clearcutting; dredging; bank hardening; poor riparian widths and composition along the majority of the river; dredging and diking in estuary (48acres summer chum rearing habitat lost); road construction at 101 restricts tidal action; isolation of of estuarine marsh from main river



Figure 7

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway: Hood Canal Salmon Enhancement Group received SRFB and NFWF funding to assess impacts from the Highway 101 causeway on historic estuary and tidal channels.

Sequenced Project List:

1. Restore estuary function
 - a. Assess Highway 101 causeway impacts
 - b. Modify Highway 101 causeway impacts
 - c. Reestablish historic sloughs
 - d. Remove levees
 - e. Analyze physical channel hydrology and hydraulics, ie. North bank salt marsh
2. Restore natural riverine function
 - a. Resstore channel complexity; install logjams/LWD
 - b. Assess/reestablish connection of mainstem with north bank salt marsh
 - c. Remove levees
 - d. Analyze physical channel hydrology and hydraulics, mainstem
 - e. Analyze sediment budget on John's Creek
3. Assess, protect, restore riparian
4. Assess/stabilize/monitor sediment sources
 - a. Remove/repair roads
 - b. Abandon logging on steep slopes

JORSTED CREEK – WRIA 16.0248

Description: stream length is 3.8 miles

Stock Status: Healthy: coho, fall chum (1992 SASSI)

Land Use: forestry;

Factors for Decline: summer low flows; sediment; Highway 101 constriction.

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Restore estuary function

NOTE: Acquisition and/or conservation easements may be needed to accomplish the following restoration activities:

- a. Assess Highway 101 and modify if necessary
- b. Soften shoreline where necessary

2. Develop local stewardship program

EAGLE CREEK – WRIA 16.0243

Description: mainstem is 3.2 miles with an additional 5.3 miles tribs

Stock Status: Healthy: coho, fall chum (1992 SASSI)

NOTE: chinook and fall chum enhancement project has been terminated

Land Use:

Factors for Decline: summer low flows; Highway 101 impacts; removal of historical connection to salt marsh.

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Restore estuary function

NOTE: Acquisition and/or conservation easements may be needed to accomplish the following restoration activities:

- a. Assess Highway 101 and modify if necessary

LILLIWAUP CREEK – WRIA 16.0230

Description: watershed is about 17.9 square miles with 6.9 miles of mainstem and 10.8 miles of tributary habitat; originates in extensive wetlands associated with Price Lake in upper Lilliwaup Valley, flows through high gradient habitat, down an impassable falls at RM 0.7 through a well developed floodplain to the estuary and Hood Canal at Lilliwaup.

Stock Status: Federally listed (threatened) – summer chum

Healthy – fall chum

NOTE: summer chum stock restoration project currently underway

Land Use: 89% of watershed is in public forest, 7% in private forest, 2% residential

Factors for Decline: forest practices; lack of channel complexity due no LWD; riparian degradation; channelization for development; road impacts.

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway: Hood Canal Salmon Enhancement Group received SRFB and NFWF funding to assess impacts from the Highway 101 causeway on historic estuary and tidal channels.

Sequenced Project List:

1. Restore estuary function
NOTE: Acquisition and/or conservation easements may be needed to accomplish the following activities:
 - a. Assess Highway 101 realignment
 - b. Assess/reduce causeway impacts
2. Protect upper watershed wetlands and assess relationship to summer low flows
3. Restore complexity
 - a. Conduct habitat survey in anadromous reach, including channel stability
 - b. Install logjams/LWD
4. Assess, protect, restore riparian



Figure 8

LITTLE LILLIWAUP CREEK - WRIA 16.0228

Description: stream is 1.05 miles in mainstem length; good year-around flows

Stock Status: **Healthy:** coho, fall chum (1992 SASSI)

NOTE: current status is questionable

Land Use:

Factors for Decline: low flows; Highway 101 impacts.

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Restore estuary function

NOTE: Acquisition and/or conservation easements may be needed to accomplish the following restoration activities:

- a. Assess Highway 101 and modify if necessary

SUND CREEK – WRIA 16.0226

Description: seasonal stream (Nov-May); natural limitation is summer low flow; stream length is 2.7 miles

Stock Status: **Healthy** – fall chum, coho (1992 SASSI)

Land Use:

Factors for Decline: shoreline development in anadromous reach

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

MILLER CREEK - WRIA 16.0225

Description: seasonal stream (Nov-May); summer low flow is a natural limitation; stream length is 2.7 miles

Stock Status: **Healthy** —fall chum, coho (1992 SASSI)

Land Use:

Factors for Decline: shoreline development in the anadromous reach

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

CLARK CREEK – WRIA 16.0224

Description: seasonal stream (Nov-May); natural summer low flow is a limitation; stream length is 1.4 miles

Stock Status: **Healthy** — fall chum, coho (1992 SASSI)

Land Use:

Factors for Decline: Highway 101 crossing

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Modify Highway 101 culvert for fish passage

FINCH CREEK – WRIA 16.0222

Description: stream length is 3.3 miles

Stock Status: **Healthy:** coho, fall chum, pink, chinook

Land Use: WDFW hatchery at mouth; rural residential

Factors for Decline: anthropogenic constrictions such as shoreline development and the Hoodspout hatchery;

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Provide fish passage beyond the hatchery and its intake
2. Add complexity

HILL CREEK – WRIA 16.0221

Description: stream length is 1.0 mile; steady flows all year;

Stock Status: Healthy: coho, fall chum

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

ENETAI CREEK – WRIA 16.0216

Description: good flows all year;

Stock Status: coho (tribal biologist)

Land Use: Tribal hatchery at mouth

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

MINERVA CREEK – WRIA 16.0215

Description: seasonal stream (Nov-May); stream length is 2.7 miles

Stock Status: Healthy – fall chum, coho (1992 SASSI)

Land Use:

Factors for Decline: cement ditch

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

SKOKOMISH RIVER – MAINSTEM – WRIA 16.0001

North Fork Skokomish (16.0001) Tributaries: Purdy Creek (16.0005); Weaver Creek (16.0006); Hunter Creek (16.0007),

South Fork Skokomish River (16.0011), Tributaries: Richert Springs (16.0010); Vance Creek (16.0013)

Description: watershed is about 240 square miles with 80 miles of mainstem and over 260 miles of tribs; drains southeast corner of Olympic Mtns; largest subestuary and intertidal delta in Hood Canal Basin; consists of three major drainages: North Fork (33.3 miles), South Fork (27.5 miles) and Vance Creek (11 miles); the North Fork originates in Olympic National Park, flows through Lake Cushman, and through a spillway to City of Tacoma Power Generating Facility on Hood Canal, with 30 cfs continuing down the stream channel (historical peak flows were 700 cfs); the South Fork originates in Olympic National Park, flows through public and private commercial forest to the North Fork; the North Fork and South Fork join to form the mainstem at RM 8 which flows through a wide alluvial valley and through the Skokomish Indian Reservation to the subestuary/delta; Vance Creek flows through public and private commercial forest, small farms to the South Fork at RM 0.8; Richert Springs is spring fed system of channels forming one channel to the mainstem at RM 7.9; Hunter, Weaver and Purdy Creeks, all spring fed, enter the mainstem at RM 6.2, 4.1 and 3.6 respectively, and with state fish hatcheries on each.

Stock Status: **Federally listed** (threatened) – summer chum, chinook
 Depressed – winter steelhead
 Healthy – upper late fall chum, coho
 Unknown – lower fall chum, summer steelhead

Land Use: hydropower on North Fork (RM 9); commercial forestry; small farms; rural residents.

Factors for Decline: reduced flows due hydropower on North Fork (FERC flows of 228 cfs is 28% of avg annual flow and is too low to support recovery of fish resources; 84% should be the minimum, according to EPA); warm water temps due water withdrawals (including hydroelectric); reduced sediment transport due low flows; loss of estuary/eelgrass habitat; dikes/levees; roads/causeways; channel complexity due removal of LWD, draining of side channels; bed instability due to channelization/dikes and storm flows; increased peak flows due forest practices; channel aggradation, flooding, dredging cycle; degraded riparian condition; water quality problems from septs and livestock.

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Restore estuary function
NOTE: Acquisition and/or conservation easements may be needed to accomplish the following restoration activities:
 - a. Modify dikes and tidegates
 - b. Reestablish tidal sloughs
 - c. Monitor agriculture conversion to subestuary habitat
2. Restore natural riverine function
NOTE: Acquisition and/or conservation easements may be needed to accomplish the following restoration activities:
 - a. Constriction abatement
 - i. Restrict development in floodplain
 - ii. Assess dike stability, function and need
 - iii. Modify dikes and floodgates
 - iv. Assess Highway 101 and modify if necessary
 - v. Assess Highway 106 and modify if necessary
 - b. Assess/stabilize/monitor sediment sources
 - i. Reduce sediment from roads
 - j. Avoid timber harvest on steep slopes
 - k. Remove/repair logging roads

- c. Restore complexity
 - i. Install logjams/LWD
 - j. Monitor bed scour (multiple tribs) and bed stability
 - k. Restore connections with wetlands, side channels
 - l. Control/remove excessive gravel in Vance Creek
- 3. Return flows to North Fork
- 4. Protect, restore riparian habitat zone, wetlands
 - a. Encourage forestry rather than conversion
- 5. Assimilate existing studies
 - a. Physical channel hydrology/hydraulics
 - b. Cost effective options
- 6. Conduct more extensive summer chum surveys

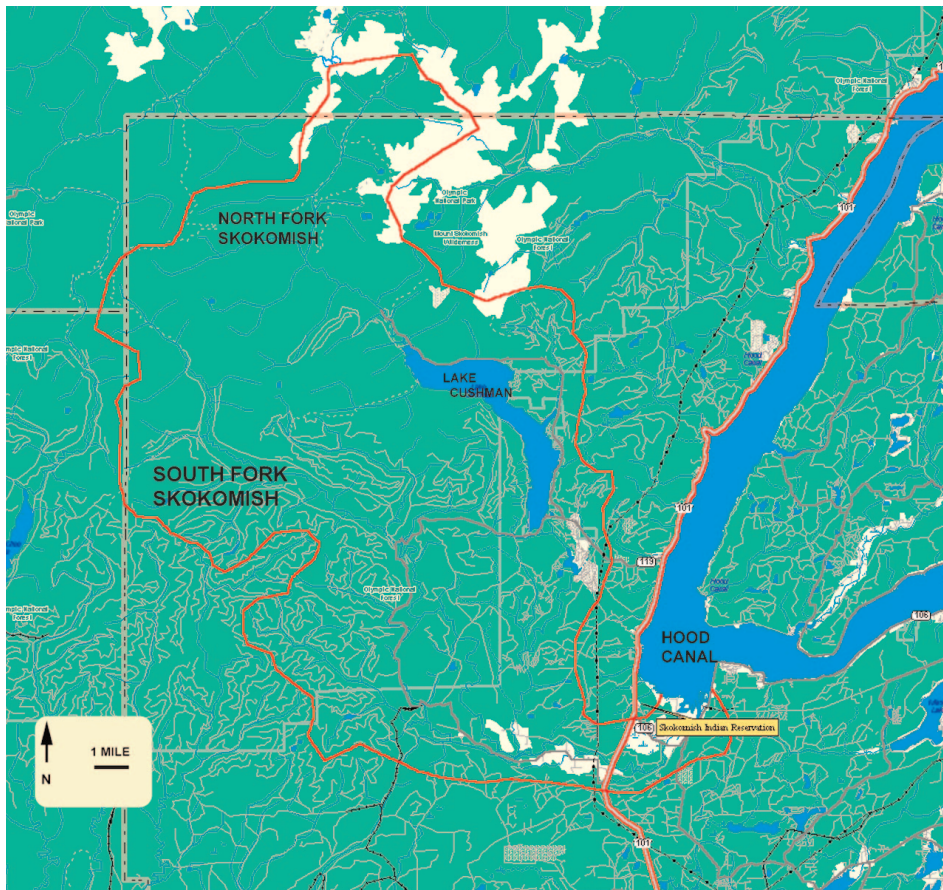


Figure 9

MASON COUNTY/WRIA 14 DRAINAGES

ALDERBROOK/BIG BEND CREEK - WRIA 14.0138

Description: This stream is composed of a mainstem and three contributing drainage tributaries totaling about 2 miles of habitat. The main stem habitat zone begins in a two acre pond and continues through a mixed conifer/deciduous forest. The first tributary enters the main stem about three hundred meters below the head of the habitat zone and the other two tributaries enter within 200 meters of the mouth of the stream.

Stock Status: Chum, coho, cutthroat are present; status is unknown

Land Use: some rural residential development

Factors for Decline: potential uppermost habitat reach limited by presence of largemouth bass

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

NOTE: Community stewardship and public education are inextricably linked to all the following actions for permanent salmon restoration.

1. Eliminate largemouth bass from uppermost reach

TWANOH CREEK – WRIA 14.0134

Description: Twanoh Creek is a springfed stream, of which the mainstem is approximately 1.3 miles in length. Tributaries contribute an additional 0.4 miles.

Stock Status: Fall chum and cutthroat are present. Status is unknown.

Land Use: State park/recreation including camping, public beach access and boat launch facilities. Fall chum are the focus of an educational kiosk in the park which provides excellent viewing of salmon returning to a small stream system. This park could provide an excellent public “forum” in which to focus more watershed education.

Factors for Decline: Riparian area in lower 400 meters of stream is degraded from proximity of parking and day use areas. This area lacks a natural succession to the riparian area. A footpath/trail follows the stream from the mouth to nearly the head-

waters. To the east of the highway, a multispace campground area is adjacent to one side of the stream. In the area of the campground, campsites adjacent to and within the riparian area have created some erosion from public traffic resulting in a potential increase in sedimentation. There is also a lack of recruitment of LWD in this portion of the creek.

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Assess, protect, and restore riparian, including canopy diversity
 - a. Provide overlook access points to minimize user impact on riparian area.
2. Establish a higher profile education component to compliment watershed wide restoration efforts.

UNNAMED – WRIA 14.0133

Description: stream is less than 0.5 miles in length

Stock Status: Unknown

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

FOREST BEACH CREEK – WRIA 14.0132

Description: The mainstem of Forest Beach Creek is approximately 1.6 miles in length. Contributing tributaries add an additional 0.8 miles to the watershed.

Stock Status: Coho and cutthroat are present. Status is unknown.

Land Use: Residential

Factors for Decline: The stream reach below a culvert barrier (at approximately 500 meters) is lightly to moderately impacted by family residences as well as a community beach. The stream reach above the culvert barrier exist in a normative state. Although several structures in the lower reach indicate restricted access for fish movement, the upper culvert is a complete blockage. The culvert (lower) at Highway 106 is inadequate for the natural movement of the streambed and acts as a barrier to fish movement during high flows. This culvert is often in need of gravel removal since it routinely fills with sediment and floods the highway during substantial rain events. The lower reaches of the stream have documented high fecal coliform measurements. Failing septic systems as well as multiple dog kennels along the lower portion of the stream likely have impacted the water quality. Oil and petroleum products have been noted near the stream from landowner activity.

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

NOTE: Community stewardship and public education are inextricably linked to all the following actions for permanent salmon restoration.

1. Assess stream for salmon habitat.
2. Replace man-made barriers for fish passage
3. Assess, protect, and restore riparian, including canopy diversity with the focus on the lower portion of the stream.
4. Assess, stabilize, and monitor sediment sources with the focus on the lower reaches.
5. Monitor water quality.

UNNAMED – WRIA 14.0131

Description: stream is less than 0.5 miles in length

Stock Status: Unknown

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

UNNAMED – WRIA 14.0130

Description: impassable natural barrier at approximately River Mile 0.2.

Stock Status: Unknown

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

HAPPY HOLLOW – WRIA 14.0129

Description: This creek is approximately 1.1 miles long which appears to drain an upper marshy wetland area. The well shaded riparian area is composed of mixed conifer/deciduous forest with diverse canopy structure throughout its entire length. The stream guide shows an impassable natural barrier at approximately River Mile 0.3.

Stock Status: Coho and cutthroat are present. Status is unknown.

Land Use: Some residential development at the lower portion of the creek.

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

NOTE: Community stewardship and public education are inextricably linked to all the following actions for permanent salmon restoration.

1. Assess the stream for salmonid habitat.
2. Assess and monitor sediment sources.
3. Monitor water quality.

UNNAMED – WRIA 14.0128

Description: stream is less than 0.5 miles in length

Stock Status: Unknown

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

HOLYOKE CREEK – WRIA 14.0127

Description: The mainstem of the stream is approximately 1.8 miles long with small tributaries contributing approximately 0.85 miles.

Stock Status: Fall chum, coho and cutthroat are present. Status is unknown

Land Use: The stream is lightly impacted by family residences on the lower reaches of the stream. Previous logging activity is evident in the upper portions of the stream, although the riparian area remains normative.

Factors for Decline: Potential for increased sedimentation due to logging activity.

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Assess stream for salmonid habitat.
2. Assess and monitor sediment sources.
3. Monitor water quality.

LAKEWOOD CREEK – WRIA 14.0126

Description: The mainstem of the stream is approximately 1.2 miles. Tributaries contribute about 0.9 miles. The stream flows through some undeveloped areas as well as low developed residential areas.

Stock Status: Coho and cutthroat are present. Status is unknown.

Land Use: Rural residential development

Factors for Decline: The stream is lightly to moderately impacted by family residences on the lower reaches of the stream. The community development at the top of the watershed has a substantial but less direct impact on the entire stream.

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

NOTE: Community stewardship and public education are inextricably linked to all the following actions for permanent salmon restoration.

1. Assess and remove fish passage barriers.
2. Conduct fish and habitat surveys to determine stream potential.
3. Assess and protect riparian, including canopy diversity.

DEVEREAUX CREEK – WRIA 14.0124

Description: This creek historically drained the northwest end of Lake Deveraux. The placement of the railroad (circa 1940s) has altered the complexion of the watershed. The lake no longer feeds directly into the watershed. As a result, the stream has been known to exhibit portions of subsurface flow in years with low annual precipitation. The stream course has been fragmented by extensive development and landscape alterations (notably a highway bypass, railroad and powerlines). Beaver activity is present in the lowest reaches of the drainage.

Stock Status: Fall chum, cutthroat and coho are present. Status is unknown.

NOTE: There are anecdotal accounts of steelhead and sockeye in this system.

Land Use: Residential development and logging activities

Factors for Decline: Logging activity, road crossings, vegetation removal for power-lines and residential development have all impacted a majority of this stream. A culvert barrier at the crossing of Highway 106 has limited the movement of fish beyond this point. The construction of the railroad has blocked the river continuum and severely altered the system.

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

NOTE: Community stewardship and public education are inextricably linked to all the following actions for permanent salmon restoration.

1. Assess and remove fish passage barriers.
2. Conduct fish and habitat surveys to determine stream potential.
3. Assess, protect and restore riparian, including canopy diversity.
4. Restore natural outlet function of the lake back into historical watershed.

MASON COUNTY/WRIA 15 DRAINAGES

SWEETWATER CREEK - WRIA 15.0505

Description: The stream is approximately 0.9 miles in length. The upper reaches flow through an established second growth forest into an area adjacent to an elementary school. A streamside salmon incubation unit has been established here. The area just beyond the school (and upstream of the highway culvert) is a marshy pond area. The stream then crosses under State Highway 3 in the southern portion of Belfair. Immediately below the culvert, the stream passes adjacent to several small businesses. From this point, the stream flows along the southern edge of a protected wetland preserve and into Hood Canal.

Stock Status: Coho, fall chum and cutthroat are present. Status is unknown.

Land Use: This stream and the adjacent Union River estuary have become the focal point for the long range planning of the Belfair urban area. This stream flows almost entirely through land that is managed by the Hood Canal Watershed Project Center in cooperation with the North Mason School District and the Thelar Land Trust. A low developed residential area and several small businesses impact the lower reach.

Factors for Decline: The highway culvert acts to constrict water flows, has a resulting plunge pool and results in limiting the movement of trout and salmon. Several small businesses and land clearing impact the riparian area below the culvert.

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

NOTE: Community stewardship and public education are inextricably linked to all the following actions for permanent salmon restoration.

1. Replace culvert at State Highway 3 (scheduled for summer, 2001).
2. Restore and protect riparian area along impacted area above and below culvert.

UNION RIVER – WRIA 15.0503

Description: The watershed is 24 square miles with 10 miles mainstem, 30 miles tributaries. The stream originates on the south and eastern sides of Gold Mountain. It flows through managed, undeveloped forest area to Union River Reservoir (City of Bremerton water supply), which is held by the Casad dam. The stream flows down McKenna Falls through low gradient broad mixed coniferous/deciduous floodplain to estuarine delta of Hood Canal. A unique characteristic of the Union River floodplain is the natural abundance of Belfast soil type (USDA Soil Survey for Mason County) consisting of silt and sandy loam. This is important when considering the type of

riparian vegetation (predominantly red cedar, maple and willow) and gravel characteristics that naturally occur along the low gradient portion of the river.

Stock Status: **Federally listed** (threatened) – summer chum, Chinook
Depressed – coho (1992 SASSI)
Healthy – fall chum (1992 SASSI)
Unknown – winter steelhead (1992 SASSI)

NOTE: Chinook HCSEG project has been discontinued; HCSEG summer chum began BY 2000.

Land Use: Managed forest in the upper portions of the watershed (above the reservoir), water storage and diversion, rural residential development, hobby farms, tree farms, gravel pits, commercial land fill, WDFW wildlife recreation area, warehouse and open storage area..

Factors for Decline: bridge constrictions (several); floodplain constriction by levees, residential development, hobby farms; bank hardening; riparian lacks conifer for LWD recruitment; summer low flows; elevated water temps; livestock; failing septic systems; estuarine impacts.

Protection/Restoration Activities Completed: HCSEG, in cooperation with Mason County and funded by HCSEG, SRFB,NFWF, and USFWS, has replaced five fish passage barriers in the watershed: Everson Creek (15.0507), Bear Creek at Old Belfair Hwy (15.0510), Bear Creek at Bear Creek Rd (15.0510), Courtney Creek (15.0505).

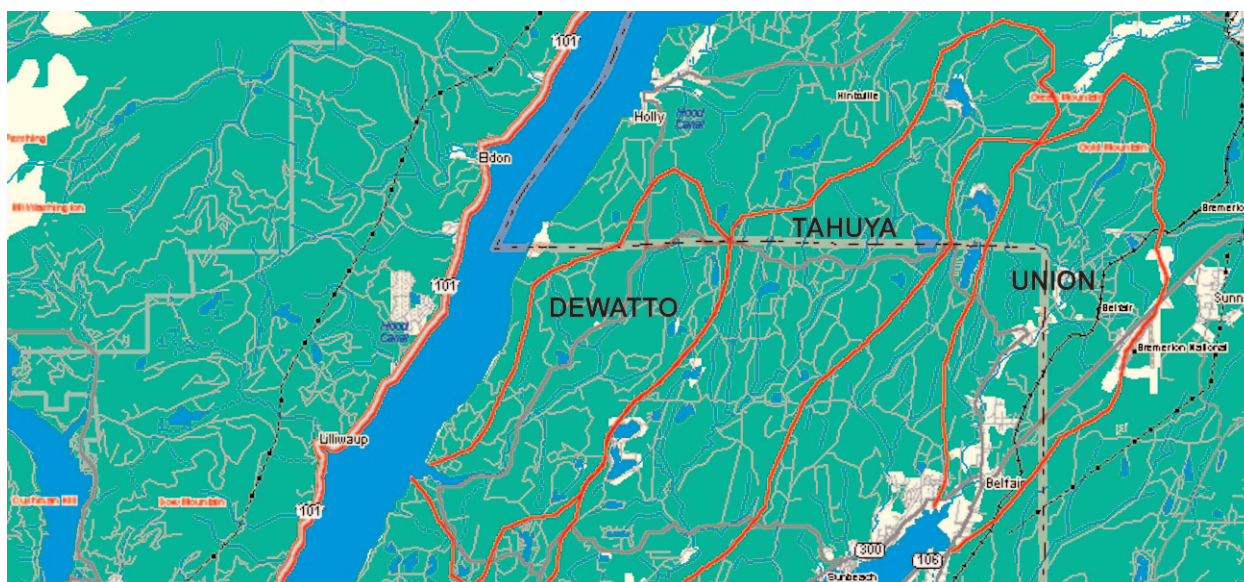


Figure 10

Protection/Restoration Activities Currently Underway: Two culvert replacement projects on the east fork of the Union River are being reviewed. A project concerning bank stabilization and sediment reduction is being developed for the Davis Farm in the lower reach.

Sequenced Project List:

NOTE: Community stewardship and public education are inextricably linked to all the following actions for permanent salmon restoration.

1. Restore estuary function
 - a. Protect through acquisition and/or conservation easements
2. Restore natural riverine function

NOTE: Acquisition and/or conservation easements may be needed to accomplish the following restoration activities:

 - a. Assess, stabilize, monitor fine sediments
 - b. Restore complexity, such as installation of LWD
3. Assess, protect, restore riparian, including canopy diversity which is consistent with soil types (incorporating diversity of mixed stand forest where appropriate).
4. Enact adequate stormwater requirements everywhere and mitigate for past practices, retrofitting where ever necessary.
5. Assess/monitor water quality/quantity
 - a. Elevate Best Management Practices
 - b. Identify impacts of Bremerton water withdrawals (5 million gal/day)
 - c. Install stream gauge
 - d. Monitor water temperature
6. Continue fish and habitat monitoring
 - a. Riverine
 - b. Natural estuary recovery
 - c. Bed scour/aggradation
7. Constriction abatement, i.e., investigate potential for dike removal at Johnson farm
8. Assess/replace fish passage barriers on small tributaries
9. Evaluate management of flood zone area; assess need for flood activity as it relates to the natural processes for maintaining ecosystem function.

BIG MISSION RIVER – WRIA 15.0495

Description: The watershed is about 13.7 square miles with about 10 miles of mainstem and 10 miles of tributaries. The headwaters originate in forested wetland above and to the northwest of Mission Lake in the western foothills of Gold Mountain. The stream then meets the western outflow of Mission Lake, flows through managed commercial forest and residential development to the mouth at

Belfair State Park on Hood Canal. A characteristic of the Big Mission River floodplain is the natural abundance of Everett gravelly loamy sand soil type (USDA Soil Survey for Mason County) which consists mostly of gravel (which is characteristic of glacial till) and lesser amounts of fines. This is important when considering the riparian vegetation (predominantly Douglas fir) and gravel composition that naturally occurs along the river.

Stock Status: **Depressed** — coho (1992 SASSI)

Healthy — fall chum (1992 SASSI)

NOTE: Habitat is considered suitable for summer chum

Land Use: Public and private commercial forest; residential development; state park at the mouth.

Factors for Decline: encroachment by residential development; road crossing constrictions and associated fill impacts; timber harvest; stream modifications and channelization; riparian buffer loss; lack of LWD and LWD recruitment; bank armoring; lack of channel complexity leading to increased redd scour; poorly sorted spawning gravels which inhibits redd formation; estuarine dikes; diked swimming area at Belfair State Park.

Protection/Restoration Activities Completed: Hood Canal Salmon Enhancement Group has replaced three culverts in the watershed, funded by USFWS, NFWF, WDFW and DNR.

Protection/Restoration Activities Currently Underway: Monitoring of fine sediment sources from Tahuya State Forest trail system with silt traps and other erosion control methods used by DNR.

Sequenced Project List:

NOTE: Community stewardship and public education are inextricably linked to all the following actions for permanent salmon restoration.

1. Restore estuary function
 - a. Assess/remove constrictions, dikes and bulkheads for riverine and estuarine impacts, i.e. those associated with Belfair State Park
 - b. Remove rip rap, dikes and/or associated fill
2. Restore natural riverine function
 - a. Assess, stabilize, monitor sediment sources
 - b. Prohibit bank hardening
 - c. Promote bioengineering techniques
 - d. Remove rip rap
 - e. Restore complexity, such as addition of LWD

4. Repeat monitoring/surveys
 - a. Water quality monitoring
 - b. Ambient monitoring parameters
 - c. Monitor bed scour/aggradation

LITTLE MISSION CREEK – WRIA 15.0493

Description: Stream is 2.1 miles long with 2.1 miles tributaries.

Stock Status: **Depressed:** coho; (1992 SASSI)
 Healthy: fall chum (1992 SASSI)

Land Use: rural residential development, state park recreation area and state timberland.

Factors for Decline: forest practices;

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Replace twin culverts and associated trash rack on North Shore Road
(partial barrier due velocity)
2. Inventory and assess current habitat

JOHNSON CREEK – WRIA 15.0492

Description:

Stock Status: Coho and fall chum present; status unknown

Land Use: Rural residential development; state timberland

Factors for Decline:

Protection/Restoration Activities Completed: Hood Canal Salmon Enhancement Group replaced one culvert in this watershed, funded by Mason Co, NFWF, and USFWS

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Assess and remedy fish passage barriers
2. Monitor water quality

HALL CREEK – WRIA 15.0491

Description:

Stock Status: Coho and cutthroat are present. Status is unknown.

Land Use: Rural residential development, state timberland

Factors for Decline: Potential fish passage barriers; water quality from residential impacts.

Protection/Restoration Activities Completed: Hood Canal Salmon Enhancement Group replaced one culvert in this watershed, funded by Mason Co, NFWF, and USFWS

Protection/Restoration Activities Underway:

Sequenced Project List:

NOTE: Community stewardship and public education are inextricably linked to all the following actions for permanent salmon restoration.

1. Assess and remedy fish passage barriers
2. Monitor water quality
3. Remove garbage

STIMSON CREEK – WRIA 15.0488

Description: The watershed is about 2.3 square miles. The stream is about 5.3 miles long.

Stock Status: **Depressed:** coho; (1992 SASSI)
 Healthy: fall chum (1992 SASSI)

Land Use:

Factors for Decline: The proximity of the Elfendahl Pass Road prevents natural meandering of the stream.

Protection/Restoration Activities Completed: Hood Canal Salmon Enhancement Group has replaced three fish passage barriers: Lower Stimson, Middle Stimson, and Upper Stimson, funded by HCSEG and SRFB. A smolt trap has been installed for evaluation.

Protection/Restoration Activities Underway:

Sequenced Project List:

NOTE: Community stewardship and public education are inextricably linked to all the following actions for permanent salmon restoration.

1. Assess/remove partial barrier (culvert) on right bank tributary

UNNAMED CREEK – WRIA 15.0486

Description: stream is less than 0.5 miles in length

Stock Status: Unknown

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

UNNAMED CREEK – WRIA 15.0485

Description: stream is less than 0.5 miles in length

Stock Status: Unknown

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

CADY CREEK - WRIA 15.0484

Description:

Stock Status:

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

LITTLE SHOOFLY CREEK – WRIA 15.0482

Description: lower reach has a fishway; debris trap at highway culvert

Stock Status: (Coho);

Healthy: fall chum (1992 SASSI)

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

SHOOFLY CREEK – WRIA 15.0478

Description: stream is 1.5 miles long;

Stock Status: Coho present

Healthy: fall chum

Land Use: Rural development; commercial and state timberland

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

TAHUYA RIVER – WRIA 15.0446

See Union river – WRIA 15.0503, page 63 for map

Description: watershed is 45.1 square miles with 21 miles mainstem and about 64.9 miles tributaries; originates in Green Mountains plateau, flows through Lake Tahuya, through gently rolling hills with low to moderate gradient, through a broad alluvial valley to the estuary; tributaries with numerous wetlands help to moderate flow; many smaller tributaries go dry in summer or winter. A characteristic of the Tahuya River floodplain is the natural abundance of Everett Gravelly Loamy Sand soil type (USDA Soil Survey for Mason County) which consist of mostly gravel (which is characteristic of glacial till) and lesser amounts of fines. This is important when considering the type of riparian vegetation that naturally occurs along the river.

Stock Status: **Federally listed** (threatened) – summer chum, Chinook
 Depressed – coho, winter steelhead (1992 SASSI)
 Healthy – fall chum (1992 SASSI)

NOTE: Chinook COOP project has been discontinued; summer chum reintroduction is in its beginning phase, existing stock is no longer viable; summer chum distribution could go to RM8

Land Use: State and private timber harvest; Tahuya ORV trail system; agriculture; rural residential development

Factors for Decline: Shoreline development and associated bulkheads, fill, erosion, docks and loss of shoreline vegetation; residential development around natural lakes, reservoirs and wetlands; forestry and associated roads contributing to increased peak winter flows; agriculture; loss of LWD; loss of species diversity within the riparian buffer; elevated water temps due loss of riparian buffer; channel instability.

Protection/Restoration Activities Completed: Hood Canal Salmon Enhancement Group has fixed thirteen fish passage barriers (culverts) in the Tahuya River watershed: School House Creek (15.0447), Haven lake Fishway (15.0461), Wooten Lake Creek (15.0461a), Charlie Creek at DBC Rd (15.0470), Charlie Creek at Toonerville Rd (15.0470), Buffin Cerek (15.0466), Little Tahuya (15.0457), Haven Lake Creek/BLR (15.0461), Unnamed Trib at Twin Lakes Road (15.0464), Twin Lake

Creek at Twin Lakes Rd (15.0463), Twin Lake Creek/BLR (15.0463), Erdman Lake Creek (15.0459), Outlet Creek at Twin lakes Road (15.0466); funded by GSRO, SRFB, USFWS, WSDOT 2496, DNR, and NFWF.

Protection/Restoration Activities Currently Underway: Salmon habitat inventory of Tahuya watershed by HCSEG using DNR (Cedarholm) protocols.

Sequenced Project List:

NOTE: Community stewardship and public education are inextricably linked to all the following actions for permanent salmon restoration.

1. Restore natural riverine function

NOTE: Acquisition and/or conservation easements may be needed to accomplish the following restoration activities:

- a. Restore complexity/stability, i.e. add LWD
- b. Eliminate bank hardening; adopt bioengineering bank protection techniques
- c. Assess wetland storage; implement stormwater planning
2. Assess, monitor water quality/quantity
 - a. Monitor gravel scour/aggradation
 - b. Install stream gauge
 - c. Monitor water temp into fall
 - d. Elevate best management practices
3. Identify/remove fish passage barriers, i.e. Grata Creek
4. Restore estuary function
 - a. Assess/reduce/eliminate causeway impacts

CALDERVIN CREEK – WRIA 15.0445

Description: The mouth of this stream flows into Hood Canal just north of the Tahuya River. The stream is 1.5 miles long.

Stock Status: (coho) (chum) (1981 Stream Catalogue)

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Currently Underway:

Sequenced Project List:

BROWN CREEK – WRIA 15.0444

Description: stream is 1.5 miles long

Stock Status:

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Currently Underway:

Sequenced Project List:

1. Replace undersized culvert at North Shore Road
2. Inventory and assess habitat

RENSLAND CREEK – WRIA 15.0439

Description: stream is 5.3 miles with 3.1 miles tributaries; lower reach is intermittent

Stock Status: Depressed: coho;
Healthy: fall chum

Land Use: forestry

Factors for Decline: low summer flows

Protection/Restoration Activities Completed

Protection/Restoration Activities Currently Underway

Sequenced Project List:

DON LAKE CREEK – WRIA 15.0438

Description:

Stock Status: (coho, chum) (1981 Stream Catalogue)

Land Use:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Currently Underway:

Sequenced Project List:

1. Inventory and assess habitat

DEWATTO RIVER – WRIA 15.0420

See Union river – WRIA 15.0503, page 63 for map

Description: The watershed is about 23 square miles with 8 miles of mainstem and 30 miles of tributaries; originates Kitsap peninsula plateau, flows through moderate gradient to mostly undisturbed estuary; numerous wetlands moderate flows

Stock Status: **Federally listed** – summer chum, Chinook
 Depressed – coho, winter steelhead (1992 (SASSI)
 Healthy – fall chum (1992 SASSI)

Land Use:

Factors for Decline: elevated stream temps; fine sediment due logging and road building; minimal LWD.

Protection/Restoration Activities Completed: Hood Canal Salmon Enhancement Group has replaced ten fish passage barriers (culverts) in the watershed: Oak Lake Creek (WRIA 15.0429), Huson Creek (15.0423), Ludvick Creek (15.0435), Unnamed Trib (15.0434), White Creek (15.0421), Shoe Creek (15.0424), Unnamed Trib (15.0427), Larson Lake Creek (15.0425), Cady Lake Creek (15.0421), and Manke Creek (15.0423a); funded by HCSEG, WSDOT 2496, Manke Timber Co., Mason Co. Public Works, and SRFB.

Protection/Restoration Activities Currently Underway:

Sequenced Project List:

NOTE: The Dewatto is Hood Canal Salmon Enhancement Group's pilot watershed for the development of their community-based watershed stewardship program. Stewardship and public education are inextricably linked to all the following actions for permanent salmon restoration.

1. Assess, protect, restore riparian zone
2. Assess, protect, estuarine habitats
3. Continue habitat (ambient monitoring) surveys
 - a. Nutrification study
 - b. Monitor gravel scour/aggradation
 - c. Install stream gauge
 - d. Monitor water temp into fall
4. Restore natural riverine function
 - a. Eliminate bank hardening; adopt bioengineering techniques
 - b. Add complexity, i.e. LWD
 - c. Control fine sediments, i.e. upgrade road/ditches and revegetate road sidecast

KITSAP COUNTY/WRIA 15 DRAINAGES

BIG ANDERSON CREEK - WRIA 15.0412

Description: watershed is approximately 5 square miles, with 4 miles of mainstem and 13 miles of tributaries; the creek originates in headwater wetlands, flows through a confined ravine and opens into a broad floodplain in lower 0.5 mile; small estuary includes a large intertidal delta.

Stock Status: **Federally listed:** summer chum (spawn between RM 0.0 to 1.1; potential summer chum habitat in lower 1.8 miles)
Depressed: coho (1992 SASSI)
Healthy: fall chum (1992 SASSI)

Land Use: primarily industrial forestry conducted by DNR and several large landowners; 3 private residences and one small farm in the lower mile; county road constricts mouth and another road is adjacent to the river and in the 100-year floodplain from RM 0.5 to mouth; 45% of the riparian zone is occupied (36% roads and 9% agriculture).

Factors for Decline: increased sediment deposition in lower mile from past logging practices and associated roads throughout watershed; increased magnitude and frequency of peak flows from road runoff; loss of LWD; county road at mouth/estuary constrains floodplain and may reduce sediment removal by tidal action.

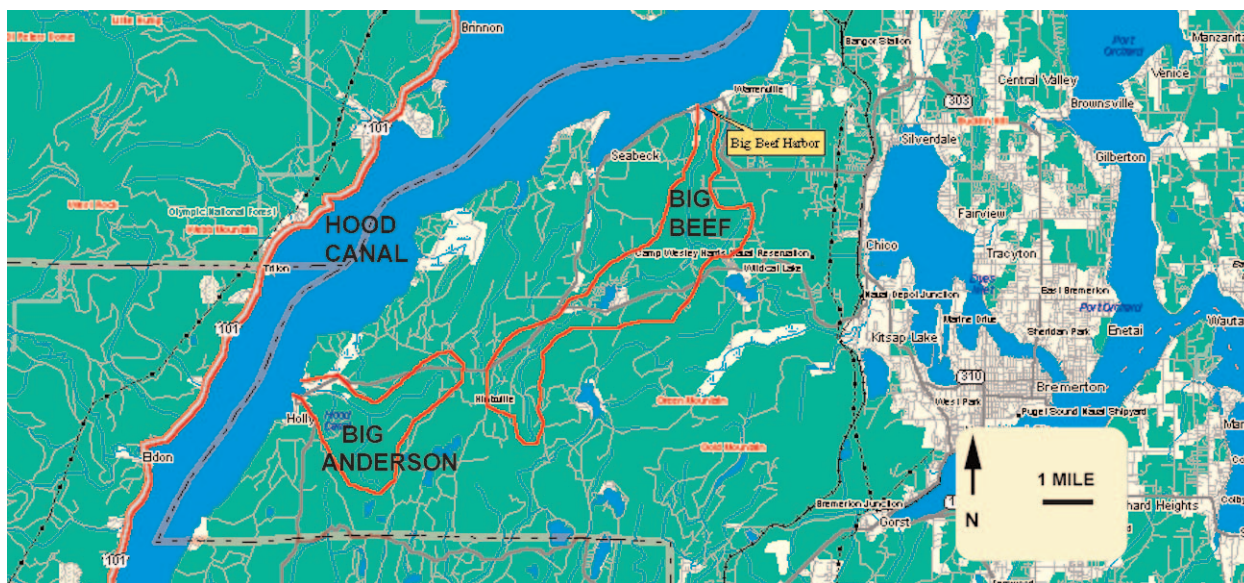


Figure 11

Protection/Restoration Activities Completed:

Protection/Restoration Activities Currently Underway:

Sequenced Project List:

1. Restore natural riverine function
 - a. Assess, stabilize, monitor sediment sources
 1. Prevent logging on unstable slopes
 2. Decommission, repair roads
 3. Redirect road ditches
 4. Limit new road construction
 - b. Restore complexity, i.e. add LWD
 - c. Remove constrictions
 1. Relocate roads outside floodplain
2. Replace constricting road fill in estuary with causeway
3. Remove abandoned railroad fill in estuary
4. Assess, preserve, restore riparian/estuary
 - a. Increase riparian buffer
5. Monitor the following parameters
 - a. Install flow meter
 - b. Conduct scour chain surveys
 - c. Conduct McNeil sediment survey
 - d. Conduct summer chum spawner surveys

HARDING CREEK – WRIA 15.0408

Description: extensive wetlands; focal sub-watershed

Land Use: commercial forest; minimal rural housing

Stock Status: **depressed:** coho (1992 SASSI)

Factors for Decline: massive slope failures; invasive bamboo; logging roads

Protection/Restoration Activities Completed:

Protection/Restoration Activities Currently Underway:

Sequenced Project List:

1. Assess, stabilize, monitor sediment sources
 - a. Decommission abandoned logging roads
 - b. Maintain logging roads and their runoff
2. Assess, protect, restore riparian
3. Conduct fish passage inventory

NELLITA CREEK – WRIA 15.0407A

Description:

Land Use:

Stock Status:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Currently Underway:

Sequenced Project List:

BOYCE CREEK – WRIA 15.0407

Description: extensive wetlands; focal sub-watershed; forested

Land Use: commercial forest; minimal housing

Stock Status:

Factors for Decline: mass wasting

Protection/Restoration Activities Completed:

Protection/Restoration Activities Currently Underway:

Sequenced Project List:

1. Assess, stabilize, monitor sediment sources
 - a. Decommission abandoned logging roads
 - b. Maintain logging roads and their runoff
2. Assess, protect, restore riparian
3. Restore complexity, add LWD

STAVIS CREEK – WRIA 15.0404

Description: watershed area is about 7 square miles, with 5 miles mainstem and 11 miles tributary habitat; the creek originates in a series of beaver ponds, forested and emergent wetlands on a flat, glacial till plain (not Morgan Marsh, although groundwater interchange is likely), flows through steep and tightly confined ravines for about 3.5 miles and opens onto a broad floodplain; riparian zone intact; the high quality estuary and delta are good examples of undisturbed estuarine lagoon and spit features in Hood Canal.

Stock Status: **Federally listed:** summer chum - low numbers (75 fish in 1972, 9 fish in 1983), assumed and potential summer chum use from RM 0.0 to 0.6

Depressed: coho (1992 SASSI)

Healthy: fall chum (1992 SASSI)

Land Use: rural residential along shorelines, lower 0.5 mile of stream and upper watershed; majority in commercial forestry with DNR and limited private holdings and Kitsap Forest Natural Area Preserve; conservation easements currently underway on lower 0.6 miles through Hood Canal Salmon Sanctuary; low concentration of shoreline development and associated impacts (bankhardening, bulkhead construction, and loss of shoreline vegetation) is primarily on shoreline to east of Stavis Creek.

Factors for Decline: sedimentation with moderate scour and fill associated with peak winter flows due to past logging practices, mass wasting and removal of LWD; short term loss of LWD recruitment.

Protection/Restoration Activities Completed:

Protection/Restoration Activities Currently Underway: Kitsap County received SRFB funding for preservation of the estuary.

Sequenced Project List:

1. Restore natural riverine function
 - a. Assess, stabilize, monitor sediment sources
 - b. Abandon roads from RM 0.0 to 0.6
 - c. Evaluate and/or modify forest practices
2. Assess, protect, restore riparian
3. Preserve, protect estuary (Hood Canal Salmon Sanctuary)
4. Correct fish passage barrier at Seabeck/Holly Road
5. Monitor the following parameters
 - a. Install flow gauge
 - b. Conduct summer chum survey

SEABECK CREEK – WRIA 15.0400

Description: watershed is about 6 square miles, with 5 miles of mainstem and 16 miles of tributaries; the creek originates in headwater wetlands on a flat glacial till plain; the creek flows north through a steep tightly confined ravine for about 2 miles and opens to a broad floodplain, small estuary with a narrow delta and Seabeck Bay.

Stock Status: **Federally listed:** summer chum not reported but potential to RM0.9 on the mainstem, RM 0.5 on tributary 15.0401 and to RM 0.3 on an unnamed right bank tributary
Depressed: coho (1992 SASSI)
Healthy: fall chum (1992 SASSI)

Land Use: rural residential, commercial forest lands, forest conversions, small scale hobby farms, limited aquaculture, the nearby town of Seabeck and a marina.

Factors for Decline: coarse sediment aggradation leading to loss of channel complexity and stranding of upstream migrating adult fish; reduction of egg survival due to scour; high levels of fine sediment in spawning gravels from road runoff, improper logging; increased predation on juveniles due to loss of stream depth and cover; loss of channel complexity leading to increased flooding frequency; altered hydrologic patterns due to reduced channel capacity; degraded riparian conditions; floodplain connectivity due rural development, channel alteration, bridge crossing; loss of LWD; estuary modification with bulkheads, residential development.

Protection/Restoration Activities Completed: Seabeck Alki Team has conducted a variety of educational projects.

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Maintain minimum flows, especially summer
 - a. Establish, monitor instream flow
 - b. Establish impervious surface target rates (5%?)
 - c. Assess channel capacity
 - d. Retrofit developments' stormwater systems
 - e. Maintain 60% watershed in forest
2. Protect, restore estuary (Hood Canal Salmon Sanctuary)
 - a. Remove railroad fill
3. Restore natural riverine function
 - a. Assess, stabilize, monitor sediment sources
 1. Improve road maintenance

- b. Preserve, restore riparian
 - c. Restore complexity, add LWD
- 4. Conduct summer chum surveys
- 5. Investigate, remove barrier log check dam below Seabeck/Holly culvert

LITTLE BEEF CREEK – WRIA 15.0399

Description:

Land Use:

Stock Status: Depressed: coho (1992 SASSI)

Factors for Decline: mass wasting; poor riparian conditions; fish passage barriers

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

- 1. Assess, stabilize, monitor sediment sources
 - a. Decommission abandoned logging roads
 - b. Maintain logging roads and their runoff
- 2. Protect, restore estuary
- 3. Assess, protect, restore riparian

BIG BEEF CREEK – WRIA 15.0389

See Big Anderson Creek – WRIA 15.0412, page 75 for map

Description: watershed is about 14 square miles, with 11 miles mainstem and 24 miles of tributaries; creek originates in a series of wetlands (Lake Symington), flows through a steep moderately confined ravine, and opens up to a well developed floodplain and complex side channel habitat; the estuary is 47.7 acres in a semi-enclosed lagoon.

Stock Status: **Federally listed:** summer chum extirpated but stock reintroduction efforts are underway (donor stock from Big Quilcene River); 1975-1976 exceeded 1000.

Depressed: coho (1992 SASSI)

Healthy: fall chum (1992 SASSI)

Land Use: intense commercial forest activities in upper watershed; agriculture; residential development around Lake Symington; UW research facility; riparian acquisition above UW.

Factors for Decline: coarse sediment aggradation; high levels fine sediment in spawning gravels; loss of channel complexity; alteration of estuarine habitats; altered hydrologic patterns; degraded riparian conditions; potential elevated temperatures.

Protection/Restoration Activities Completed: Hood Canal Salmon Enhancement Groups designed and built a summer chum spawning channel in the lower flood-plain, funded by GSRO and SRFB; HCSEG replaced a fish barrier (culvert) in the upper watershed, funded by DNR/JFE.

Protection/Restoration Activities Underway: The education center at the University of Washington facility on Big Beef is developing K-12 curriculum and is actively reestablishing university research.

Sequenced Project List:

1. Monitor/establish/restore the following:
 - a. Flows: establish instream flows - summer lows and winter highs
 - b. Monitor water temperatures
 - c. Deepen outlet at Lake Symington
2. Protect/restore estuary function
 - a. Expand bridge span/remove causeway
 - b. Evaluate role/function of WDFW weir
 - c. Remove UW service road
3. Restore natural riverine function
 - a. Add complexity; install LWD
 - b. Restore wetlands, side channels at UW
 - c. Assess, stabilize, monitor sediment sources
 1. Discontinue logging on steep slopes
 2. Decommission abandoned roads, reroute road ditches
 3. Prohibit new roads near ravines at Lake Symington
 4. Establish impervious surface thresholds
4. Assess, protect, restore riparian, retain 60% watershed in forest cover

JOHNSON CREEK – WRIA 15.0387

Description:

Land Use:

Stock Status:

Factors for Decline:

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

LITTLE ANDERSON CREEK – WRIA 15.0377

Description: extensive wetlands;

Land Use:

Stock Status:

Factors for Decline: mass wasting; poor riparian cover; fish passage barriers

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Replace culvert at Anderson Hill Road
2. Assess, stabilize, monitor sediment sources
 - a. Decommission abandoned roads
 - b. Maintain, manage road surface and their runoff
3. Protect, restore property downstream of culvert and upstream of park
4. Maintain county park at estuary
 - a. Maintain low impact status
 - b. Control, eliminate invasive species
5. Protect, restore riparian

CATTAIL LAKE CREEK – WRIA 15.0370

Description:

Land Use:

Stock Status:

Factors for Decline: gravel accumulation

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

JUMP-OFF-JOE CREEK – WRIA 15.0369

Description:

Land Use:

Stock Status:

Factors for Decline: gravel accumulation

Protection/Restoration Activities Completed:

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Assess, stabilize, monitor sediment sources
2. Conduct fish passage inventory

COUGAR CREEK – WRIA 15.0367

Description: Cougar Creek is known locally as Wildcat Creek; Kinman Creek (WRIA 15.036*) is a tributary to Cougar Creek.

Land Use: rural residence; agriculture; livestock

Stock Status:

Factors for Decline: passage barriers; water quality

Protection/Restoration Activities Completed: Culvert on Kinman Creek at Hwy 3 has been replaced.

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Replace tributary culvert at Hwy 3
2. Assess, stabilize, monitor sediment sources
3. BMPs for livestock runoff
4. Assess, protect, restore riparian

GAMBLE CREEK – WRIA 15.0356

Description:

Land Use: rural residence; agriculture

Stock Status: coho, chum

Factors for Decline: straightened channels; ditching; diking; water quality; loss of riparian and LWD recruitment; lack of structure; water temperatures

Protection/Restoration Activities Completed: Kitsap County Conservation District conducted stream restoration (sinuosity, complexity, cattle exclusion fencing and riparian planting), funded by KCCD and North Olympic Salmon Coalition;

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Protect, restore shoreline near Port Gamble
2. Restore complexity
 - a. Add LWD
 - b. Restore sinuosity
 - c. Apply BMPs for agriculture
 - d. Replant riparian
3. Assess, monitor flows
 - a. Monitor withdrawals
 - b. Monitor water temperatures

MARTHA JOHN – WRIA 15.0354

Description:

Land Use: rural residential; agriculture

Stock Status:

Factors for Decline: loss of riparian and LWD, water quality; lack of structure; ditching

Protection/Restoration Activities Completed: Port Gamble Sklallam Tribe conducted stream restoration (sinuosity, complexity, cattle exclusion fencing and riparian planting), funded by PGST and North Olympic Salmon Coalition;

Protection/Restoration Activities Underway:

Sequenced Project List:

1. Apply Best Management Practices for livestock/agriculture
2. Protect headwater wetlands
3. Protect forested habitat

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